Exhibit 72

IN RE JOHNSON & JOHNSON TALCUM POWDER PRODUCTS MARKETING, SALES PRACTICES, AND PRODUCTS LIABILITY LITIGATION
MDL NO. 16-2738 (FLW) (LHG)

Shu-Chun Su
2024-05-21

Credentials

My name is Shu-Chun Su. I have developed methods and published on issues related to the identification of asbestos by polarized light microscopy (PLM) throughout my more than forty-year career.

I was born in China. I majored in Geochemistry at the Department of Geology, Peking University, for my bachelor's, a six-year program mirroring science programs at Moscow University. My Optical Crystallography was a two-semester (40 weeks) course. So was Optical Mineralogy. These two courses are the foundations of identifying rock-forming minerals using PLM. American Geology departments teach these two subjects in several weeks, not as complete semester courses. I graduated from Peking University in 1964, and I worked as a geological engineer in the Geological Survey of Gansu Province of China for 14 years. My job was to identify rock and mineral samples collected by field geologists in the geological mapping of the Gansu Province using a Zeiss polarized light microscope. Serpentine asbestos (chrysotile) was a common mineral species among the field samples of ultramafic rocks in that area. I developed expertise in the identification of asbestos—and specifically chrysotile—during my work here.

In 1979, I attended the Institute of Geology, Chinese Academy of Science, for graduate studies and obtained my Master's Degree in Mineralogy in 1981. Then, I came to the United States to pursue my doctoral studies at Virginia Institute of Technology and State University under Professor Donald Bloss, the preeminent, world-renowned expert in optical crystallography. My doctoral thesis was the study of silicate minerals by light and electron microscopy and X-ray diffraction spectroscopy, which are the same techniques used to analyze asbestos. The identification of chrysotile and other asbestos minerals by light microscopy is something that I have been researching and publishing for more than forty years.

After obtaining my Ph.D. in geology in 1985, I did two years of postdoctoral research in the development of an automatic optical instrument for measuring minerals' refractive index invented by Professor Bloss. I went to work at the Research Center, Hercules Incorporated, a specialty chemical and aerospace company. I was the director of the Optical and Electron Microscopy Laboratory in Wilmington, Delaware. My job was to characterize materials produced and researched by the company using various optical and electron microscopy techniques. As part of this work, I characterized chrysotile and other types of asbestos by PLM.

In 1988, I was recruited to become a Technical Expert in the Bulk and Airborne Asbestos Programs by the National Voluntary Laboratory Accreditation Program (NVLAP) under the Department of Commerce, a government office regulating asbestos analysis laboratories. Since then, I've conducted approximately one thousand on-site audits of asbestos laboratories, mainly in the United States but also in Canada, Japan, and Korea. These audits assess the laboratories' managerial and

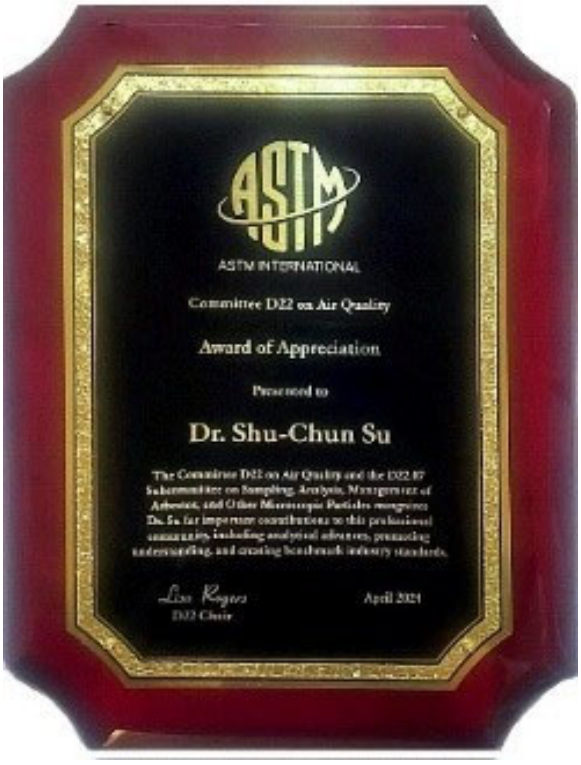
technical proficiency in conducting standardized PLM and TEM asbestos analyses. Every asbestos laboratory with (or seeking) NVLAP accreditation performs PLM asbestos analyses.

To date, I've authored 29 publications on asbestos analysis, which are identified in my biography, which is attached as **Exhibit A**.

In the area of airborne asbestos analysis, I have created 880 pages of comprehensive tables for the identification of amphibole asbestos, which has been widely used by airborne asbestos laboratories around the world.

My most well-known contribution to asbestos analysis is a standard operating procedure to quickly and accurately measure the refractive index (RI) of asbestos minerals (the primary diagnostic optical property of "fingerprinting" asbestos minerals) using the central stop dispersion staining technique by PLM. This procedure is accurate and highly efficient, reducing a lengthy ten-minute graphic solution of RI value into 10 seconds. This technique has been referred to as the "Su Method" by scientists practicing in this area and has been cited in textbooks addressing the identification of asbestos by PLM. The Su Method has been adopted by most analytical laboratories performing PLM analyses in the United States and overseas. In fact, Dr. William Longo's laboratory MAS reports that they themselves have been using my Su Method for Johnson's Baby Powder analyses.

In April 2024, at ASTM International's Michael Beard Conference on Asbestos Terminology, the organization presented me with an award recognizing my career-long contributions to asbestos analysis, including recognizing the "Su Method" as a significant achievement in PLM analytical procedures.



As noted above, I am an accomplished expert in the characterization of asbestos minerals by PLM. It has been a focus of my entire career. As such, I am uniquely qualified to assess whether or not a laboratory's PLM data identifying asbestos using my Su Method is reliable and accurate.

Scope of Analysis

I have been asked to review PLM data put forth by Dr. Longo's laboratory MAS in which he claims to identify "chrysotile" in Johnson's Baby Powder by PLM using central stop dispersion staining. I am being compensated at a rate of $800 per hour for my scientific analysis of this issue. I have not provided any deposition or trial testimony in the past four years.

A list of the MAS reports that I reviewed identifying "chrysotile" in Johnson's Baby Powder is identified in **Exhibit B**.

As I explain further below, I disagree with each and every single PLM identification of "chrysotile" in Johnson's Baby Powder made by Dr. Longo's laboratory in the reports that I have reviewed. The data presented by MAS demonstrate significant deficiencies in all areas, which leads me to conclude that the laboratory is incapable of performing the most fundamental aspects of PLM analysis or correctly identifying chrysotile by PLM. A summary of the analytical failings of MAS appears below and is expanded upon in the demonstrative materials that I have attached as **Exhibit C**. The bases for my opinions are my experience, education, training, my publications that are listed in **Exhibit A**, and the sources cited in this report and the attached **Exhibit C**.

Summary of Analysis

Dr. Longo's laboratory's identification of "chrysotile" in Johnson's Baby Powder by PLM is incorrect and unreliable for the following reasons:

1. **MAS's Procedure for Measuring Refractive Index Values is Inaccurate and Unreliable**

    a. **MAS Used Suppressed Light Intensity, Leading to Inaccurate and Unreliable Refractive Index Value Determination**

In order to accurately measure the RI value of a mineral by PLM, it is fundamental that the equipment used needs to be set appropriately. MAS routinely uses insufficient light intensity, as if the light intensity was suppressed, which in turn subdues the dispersion staining color, resulting in a subdued RI value and a subdued birefringence value. The result is that talc's high γ and the associated birefringence are suppressed, making the elongated talc particle look like chrysotile. If the light suppression is unintentional, then MAS has failed to conduct basic PLM procedures, such as adjusting the light intensity and aperture diaphragm to optimal condition to achieve a fully and adequately displayed dispersion staining color or accurately calibrating the objective lens so that it can measure particles size accurately (as I will discuss further below).

I describe examples of this problem on pages 2 through 5 of **Exhibit C**.

b. Inaccurate Refractive Index Measurement Procedure Leads to Unreliable Results

MAS routinely fails to accurately identify the RI value exhibited by particles in its PLM analyses. There are numerous instances of MAS assigning an RI value that is simply wrong (and incorrectly closer to values that may be associated with chrysotile rather than talc). Based on my review of the reports identified in **Exhibit B**, the data presented by MAS demonstrates a systematic failure to assign RI values correctly. I describe examples of this systematic problem on pages 6 through 11 of **Exhibit C**.

In addition, there are other instances in which a talc particle exhibits a distorted dispersion staining color due to the total reflection occurring at the liquid-solid interface that a proficient PLM analyst who understands the basic principles of the central stop dispersion staining technique would recognize as a common phenomenon. Instead, MAS used the distorted dispersion staining color for RI assignments, leading to incorrect RI value, which, in turn, led to the misidentification of talc particles as "chrysotile." I describe examples of this problem on pages 12 through 14 of **Exhibit C**.

c. Dr. Longo's Claim That Particle Sizes Change Refractive Index Values Is Wrong

A mineral's RI is a constant governed by their chemical composition and crystal structure. MAS's theory that chrysotile's RI increases as the particle size decreases is unfounded and defies basic principles of physics. In fact, if such a theory is proved, it would shake the very foundation of physics.

The National Institute of Standards and Technology (NIST) Standard Reference Material (SRM) 1866 chrysotile RI values, α 1.549 and γ 1.556, were measured by John Phelps, a scientist at NIST, on a single fiber using the spindle stage technique. I know these details because John Phelps was in communication with me during the measurements that became the published SRM reference values. The spindle stage technique was invented by Professor Donald Bloss, my Ph.D. supervisor. I am an expert in this technique and author of the computer program used in the spindle stage measurement procedure. The "chrysotile" fibers that MAS claims to identify in Johnson's Baby Powder by PLM cannot be any thinner than the NIST SRM 1866 single chrysotile fiber that serves as the data point for the certified RI values for this material. MAS's claim that the particle sizes of "chrysotile" it finds in PLM analyses of Johnson's Baby Powder are so unique is not only unfounded but also without the support of credible measurement data that directly refutes the claim. I describe this problem on pages 15 and 16 of **Exhibit C**.

Another critical fact is that certified NVLAP RI values of "Calidria" chrysotile—a unique form of chrysotile from California that MAS claims is similar to the "chrysotile" it finds by PLM in Johnson's Baby Powder—are α 1.555 and γ 1.560, which are only 0.004 - 0.006 higher than the SRM 1866 chrysotile, documented by NVLAP in "ANALYSIS SUMMARY FOR NIST BULK ASBESTOS PROFICIENCY TESTING February 2001, Test Round M12001." Again, MAS's claim that the particle sizes and RI values of the "chrysotile" it found in PLM analyses of Johnson's Baby Powder are a match for Calidria chrysotile are inaccurate and not supported by the data. I describe this problem on page 17 of **Exhibit C**.

d. MAS's Complete Misunderstanding of My Central Stop Dispersion Staining Color Conversion Tables Leads to Incorrect and Unreliable "Chrysotile" Identification

I have created and published procedures and reference tables that help analysts measure RI values of the six regulated asbestos minerals, including chrysotile. MAS relies upon my procedure and tables as part of its PLM analyses of Johnson's Baby Powder.

However, Dr. Longo completely misunderstood my reference table and claimed that the RI range of my chrysotile table represents the chrysotile's minimum and maximum RI values. This is not true.

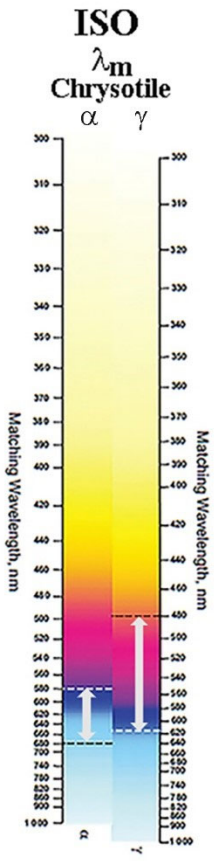
To illustrate, in the International Organization for Standardization (ISO) chart included in the 22262-1 method, the possible α and γ RI ranges of chrysotile are only a small section (between the dotted lines in the following figure) of the dispersion staining color chart; the chart must cover the whole dispersion staining color spectrum, and the same is true of my conversion table. The ranges of the ISO chart and my table must be much wider than the RI range of chrysotile.

My table is the numerical version of the ISO graphic chart for people who understand the principle. For people who do not understand this basic principle of my procedure and tables, it is impossible to correctly perform the analytical procedure of RI measurement by dispersion staining technique.

Chrysotile

in Cargille 1.560 (E)

λ_m	α							γ						
(nm)	17°C	19°C	21°C	23°C	25°C	27°C	29°C	17°C	19°C	21°C	23°C	25°C	27°C	29°C
300	1.652	1.651	1.650	1.649	1.648	1.647	1.646	1.645	1.644	1.643	1.642	1.641	1.641	1.640
320	1.632	1.631	1.630	1.629	1.628	1.628	1.627	1.627	1.626	1.625	1.624	1.623	1.622	1.621
340	1.618	1.617	1.616	1.615	1.614	1.613	1.613	1.614	1.613	1.612	1.611	1.610	1.609	1.608
360	1.607	1.606	1.606	1.605	1.604	1.603	1.602	1.604	1.603	1.602	1.601	1.600	1.599	1.599
380	1.599	1.598	1.597	1.596	1.595	1.595	1.594	1.596	1.595	1.595	1.594	1.593	1.592	1.591
400	1.593	1.592	1.591	1.590	1.589	1.588	1.587	1.590	1.589	1.588	1.588	1.587	1.586	1.585
420	1.587	1.586	1.585	1.584	1.583	1.583	1.582	1.585	1.584	1.583	1.583	1.582	1.581	1.580
440	1.583	1.582	1.581	1.580	1.579	1.578	1.577	1.581	1.580	1.579	1.578	1.577	1.577	1.576
460	1.579	1.578	1.577	1.576	1.575	1.574	1.573	1.578	1.577	1.576	1.575	1.574	1.573	1.572
480	1.576	1.575	1.574	1.573	1.572	1.571	1.570	1.575	1.574	1.573	1.572	1.571	1.570	1.569
500	1.573	1.572	1.571	1.570	1.569	1.568	1.567	1.572	1.571	1.570	1.569	1.568	1.567	1.567
520	1.570	1.569	1.568	1.567	1.567	1.566	1.565	1.570	1.569	1.568	1.567	1.566	1.565	1.564
540	1.568	1.567	1.566	1.565	1.564	1.563	1.563	1.568	1.567	1.566	1.565	1.564	1.563	1.562
560	1.566	1.565	1.564	1.563	1.562	1.562	1.561	1.566	1.565	1.564	1.563	1.562	1.561	1.560
580	1.564	1.563	1.563	1.562	1.561	1.560	1.559	1.564	1.563	1.562	1.562	1.561	1.560	1.559
600	1.563	1.562	1.561	1.560	1.559	1.558	1.557	1.563	1.562	1.561	1.560	1.559	1.558	1.557
620	1.561	1.560	1.560	1.559	1.558	1.557	1.556	1.562	1.561	1.560	1.559	1.558	1.557	1.556
640	1.560	1.559	1.558	1.557	1.556	1.556	1.555	1.560	1.559	1.559	1.558	1.557	1.556	1.555
660	1.559	1.558	1.557	1.556	1.555	1.554	1.553	1.559	1.558	1.557	1.557	1.556	1.555	1.554
680	1.558	1.557	1.556	1.555	1.554	1.553	1.552	1.558	1.557	1.556	1.556	1.555	1.554	1.553
700	1.557	1.556	1.555	1.554	1.553	1.552	1.551	1.557	1.556	1.556	1.555	1.554	1.553	1.552
720	1.556	1.555	1.554	1.553	1.552	1.551	1.550	1.557	1.556	1.555	1.554	1.553	1.552	1.551
740	1.555	1.554	1.553	1.552	1.551	1.551	1.550	1.556	1.555	1.554	1.553	1.552	1.551	1.550
760	1.554	1.553	1.552	1.552	1.551	1.550	1.549	1.555	1.554	1.553	1.552	1.551	1.550	1.550
780	1.554	1.553	1.552	1.551	1.550	1.549	1.548	1.554	1.553	1.553	1.552	1.551	1.550	1.549
800	1.553	1.552	1.551	1.550	1.549	1.548	1.547	1.554	1.553	1.552	1.551	1.550	1.549	1.548
850	1.551	1.550	1.550	1.549	1.548	1.547	1.546	1.552	1.551	1.550	1.550	1.549	1.548	1.547
900	1.550	1.549	1.548	1.547	1.546	1.546	1.545	1.551	1.550	1.549	1.548	1.547	1.547	1.546
950	1.549	1.548	1.547	1.546	1.545	1.544	1.543	1.550	1.549	1.548	1.547	1.546	1.546	1.545
1000	1.548	1.547	1.546	1.545	1.544	1.543	1.542	1.549	1.548	1.547	1.546	1.546	1.545	1.544



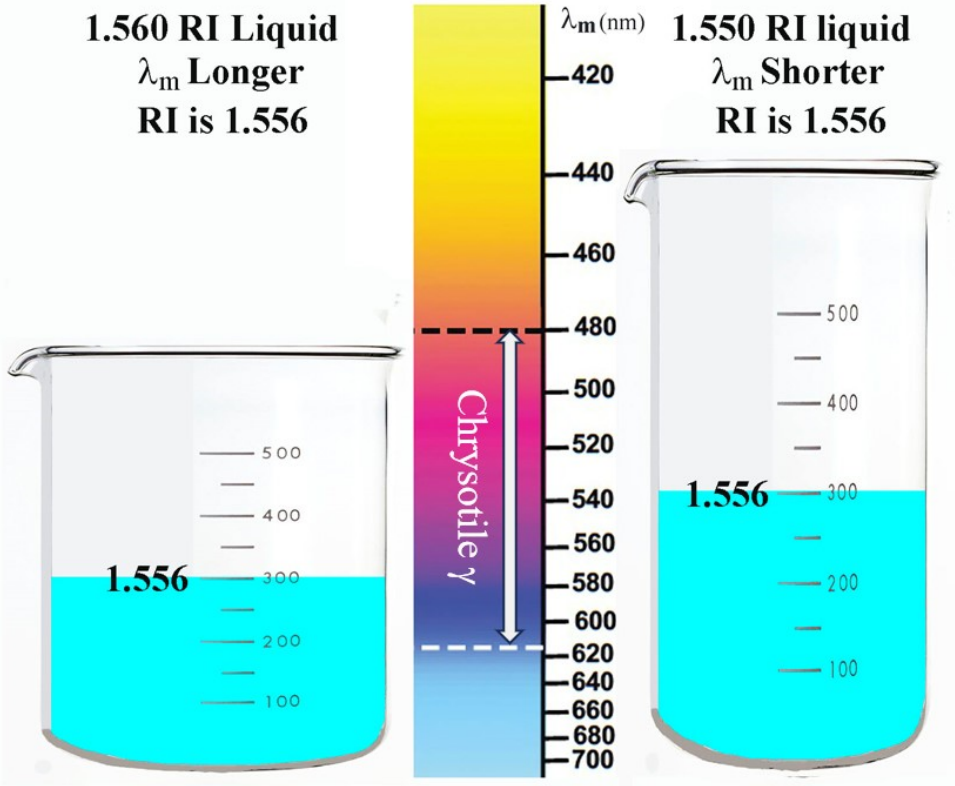
I describe this problem on pages 18 through 20 of **Exhibit C**.

e. Dr. Longo's Understanding of the Refractive Index Liquid's Effect on Mineral's Refractive Index Values Is Wrong

In 2022, I published a paper on the application of the dispersion staining technique to asbestos analysis. I recommended the use of 1.560 RI liquid for measuring the γ of Calidria chrysotile to improve the accuracy of measurement.

The only purpose of switching from 1.550 to 1.560 is to improve the accuracy of RI measurement because chrysotile's RI is a constant and does not change with the surrounding liquid medium.

When the same mineral is measured in two different RI liquids, its RI remains the same, but the matching wavelength λm changes accordingly: the lower liquid produces a shorter λm and the higher liquid produces a longer λm.



The above diagram shows two beakers; the left one is wider, representing 1.560 liquid, and the right one is thinner, representing 1.550 liquid. The volume of water represents the γ refractive index.

The 300 milliliters of water volume – γ value – does not change, but the water level – λ_m – changes from a shorter (upper) matching wavelength to a longer (lower) matching wavelength.

In 2022, Dr. Longo switched to 1.560 RI liquid. Without any background in optical crystallography, he mistakenly thought measuring in the 1.560 RI liquid would give his laboratory results different from those using 1.550 RI liquid. As noted below, MAS's use of the 1.560 RI liquid produced a suite of α and γ values similar to the 1.550 RI liquid values, none of which establish the

presence of chrysotile.

M71614-M71643-M71740 J&J Baby Powders

Date	MAS No.			γ		α	
				Low	High	Low	High
2023-02-28	**M71614**	**001**	**1**	1.564	1.564	1.561	1.561
			2	1.565	1.565	1.561	1.561
			3	1.568	1.568	1.557	1.560
			4	1.565	1.568	1.560	1.564
2023-10-19	**M71643**	**001**	**1**	1.566	1.566	1.561	1.561
			2	1.566	1.569	1.557	1.561
			3	1.561	1.561	1.552	1.552
			4	1.568	1.568	1.559	1.559
2024-02-15	**M71740**	**001**	**1**	1.564	1.564	1.560	1.560
			2	1.564	1.564	1.560	1.560
			3	1.565	1.565	1.562	1.562
			4	1.563	1.563	1.561	1.561
			Average	**1.565**	**1.565**	**1.559**	**1.560**
			Grand Average	**1.565**		**1.560**	

The above table summarizes 12 pairs of α and γ values from 2023 (M71614 and M71643) and 2024 (M71740) reports.

Three Types of Chrysotile

Type	α	γ	Birefringence	RI	Source
SRM 1866	1.549	1.556	0.007	Standard	NIST
Calidria	1.555	1.560	0.005	Significantly higher than 1866	NVLAP
New?	1.560*	1.565*	0.005	Significantly higher than Calidria	MAS

* Average of 12 samples in M71614, M71643, and M71740.

When I used the term "significantly higher" to describe Calidria chrysotile as compared to NIST SRM 1866 chrysotile, the RI values were in the area of .006 to .004 higher as described above. MAS's "chrysotile" is another "significantly higher" increase above Calidria chrysotile. Were those data credible (and they are not), MAS single-handedly discovered a new type of chrysotile, whose RI is significantly higher than the Calidria chrysotile as shown in the above table. Obviously, there has never been any report of the existence of such a unique type of chrysotile with such peculiar optical properties. MAS is simply wrong again.

I describe this problem on pages 21 and 22 of **Exhibit C**.

2. MAS's Procedure for Measuring Particle Sizes is Inaccurate and Unreliable

a. Scale Bars Are Completely Inaccurate

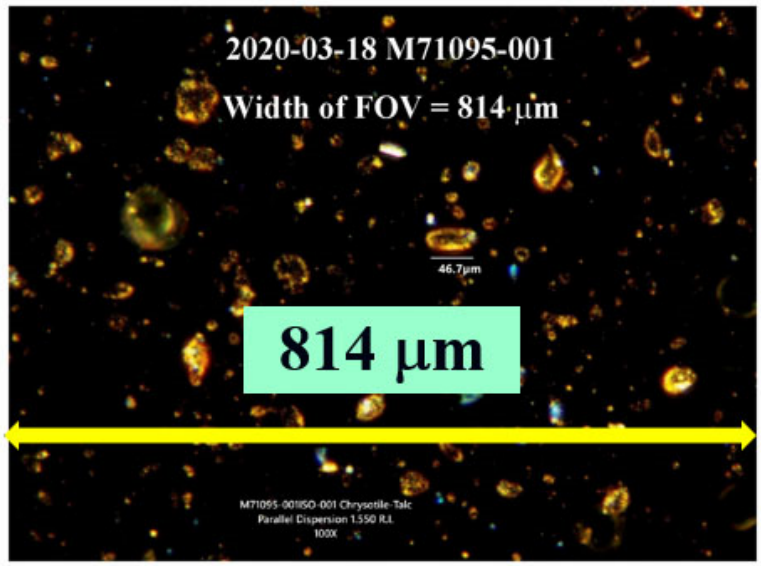
Mineral	Minimum (μm)	Average (μm)	Maximum (μm)	Reference
Talc	1.5	9.3	37.0	MAS (2017)
SG-210 Chrysotile	3.0	8.0	10.0	MAS (2023)

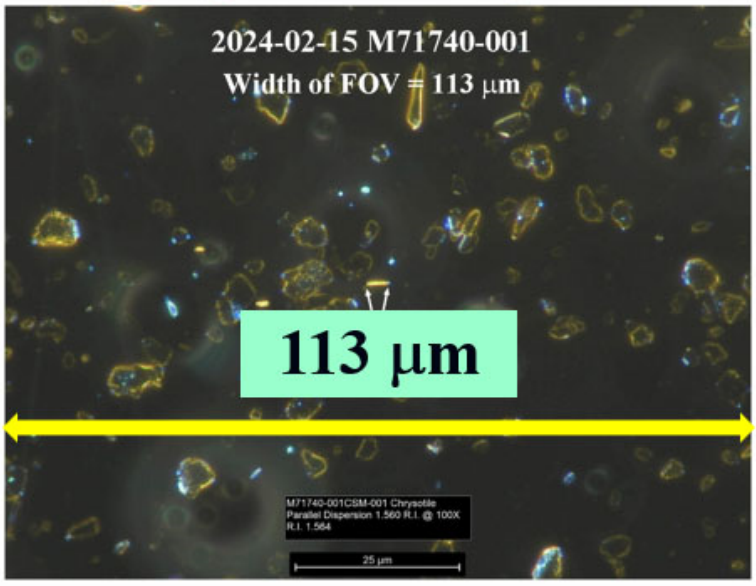
MAS reported the above talc particle size data from analyzing approximately 30 containers of Johnson & Johnson talcum powder products by SEM using image analysis software in 2017. The maximum particle size is 37 micrometers, which makes sense because the specification of Baby Powder is passing through a 325 mesh (44 micrometers) sieve.

Date	MAS No.	Chrysotile Length (μm)		
		Individual	Average	vs. Talc
2020-02-24 M70484	001-001	78.8	61.6	Same partcle size range as talc
	001-002	33.3		
	001-003	38.5		
	001-004	71.3		
	001-005	62.2		
	001-006	57.0		
	001-007	70.4		
	001-008	49.6		
	002-001	58.5		
	002-002	78.5		
	002-003	79.3		
2020-03-18 M71095	001-001	46.7	32.2	Same partcle size range as talc
	001-002	13.3		
	001-003	34.8		
	001-004	34.1		
2020-03-20 M70877	001-001	60.0	37.6	Same partcle size range as talc
	001-002	25.9		
	001-003	23.0		
	001-004	41.5		
2021-05-25 M71228	001-001	105.2	55.2	Same partcle size range as talc
	001-002	59.5		
	001-003	17.2		
	001-004	38.8		
2022-03-11 M71262	001-001	32.8	32.8	Same partcle size range as talc
	001-002	21.6		
	001-003	26.7		
	001-004	50.0		
2023-03-28 M71614	001-001	6.0	4.9	Same partcle size range as talc
	001-002	5.1		
	001-003	3.9		
	001-004	4.8		
2023-10-19 M71643	001-001	3.9	3.8	Same partcle size range as talc
	001-002	6.6		
	001-003	2.2		
	001-004	2.7		
2024-02-15 M71740	001-001	3.6	8.5	Same partcle size range as talc
	001-002	9.4		
	001-003	12.0		
	001-004	8.9		

The above table summarizes eight reports over the last five years. The dramatic variation of the "chrysotile" particle size, which is in the same size ranges as talc that can be seen in the PLM photomicrographs in each of the above reports, clearly indicates inaccurate scale bars, leading to inaccurate particle size measurements.

The creation of an accurate scale bar is a fundamental (and normally very easy) procedure of PLM. Over the years, MAS's systematic failure to create accurate scale bars for their analyses of Johnson's Baby Powder by PLM can only be attributed to the lack of basic expertise of MAS's analysts.





The width of the field of view (FOV) can be calculated from the scale bar length or the width of an object in the image. In the March 18, 2020 report M71095, the 814 µm field of view (FOV) width was wrong. Five years later, the mistake remained uncorrected. The February 15, 2024 report M71228 still reported a grossly wrong FOV width of 113 µm. Regardless of the microscope's make, Olympus

Nikon Leitz or Leica, the FOV width for a 10X objective lens is slightly over 1 mm or 1,000 µm.

What is important is that the particle sizes in these two micrographs with drastically different FOV widths are the same. That is because they are taken at the same magnification but the scales reported by MAS are wrong.

The only conclusion is that MAS is not capable of correctly performing PLM's most fundamental operation procedure: measuring the sizes of particles that it is analyzing. On occasion, the particle sizes are incorrect by ten times or more.

I describe this problem on pages 23 through 25 of **Exhibit C**.

b. If Chrysotile Was Truly Present In Johnson's Baby Powder, Its Particle Sizes Would Not Match Talc, as MAS Claims

Although MAS fails to correctly measure particle size by PLM, the micrographs in every Johnson's Baby Powder analytical report document the undeniable fact that the particle size of the claimed "chrysotile" matches the particle size of the surrounding talc. If that were true, it means the chrysotile's particle size was reduced to the particle size range of talc particles during the milling process of Johnson's Baby Powder production.

Chrysotile is a mineral with a very high tensile strength, around 100,000 pounds per square inch. It is so strong that it used to be woven into fabrics for making heat protection gears used in steel mills. It is also a super anti-abrasion additive used to make automobile braking shoes.

On the other hand, talc is the softest mineral on Earth. It is easily breakable.

The two minerals have drastically different grinding behaviors. When ground together, talc is easily and quickly ground into fine powders, whereas chrysotile is reduced to a particle size of hundreds of micrometers, significantly larger than talc. This differential grinding effect has been confirmed by US Pharmacopeia (2022) and Pier (2017).

Therefore, the "chrysotile" particles within the particle size range of talc powders cannot be chrysotile. They are talc.

I describe this problem on pages 26 through 52 of **Exhibit C**.

3. MAS's Procedure for Reporting Amounts of "Chrysotile" Identified in Johnson's Baby Powder is Inaccurate and Unreliable

a. Visually Estimated Percentages Are Inherently Unreliable

EPA bulk asbestos analysis procedure requires a point counting procedure for the asbestos quantification. The visual estimate procedure cannot quantify asbestos concentration at 0.00x% level, let alone 0.000x% level. NVLAP requires calibrated visual estimates (CVEs) for quantifying asbestos by PLM at the 1% level. Even at the 1% level, CVEs are difficult and require visual reference charts of the type that I have published. Yet MAS claims that it is capable of performing visual estimates of "chrysotile" concentrations beyond one ten thousandth of a percent without so much as a visual

reference chart against which to compare. There is no scientific justification for this claim and certainly no methodology or validation establishing the accuracy of these visual estimates by MAS.

I describe this problem on pages 53 through 64 of **Exhibit C**.

b. Fiber Per Gram Figures Based on Inappropriate Extrapolation from Unpublished Method with No Calculated Rate of Error

Dr. Longo's unpublished "concentration" preparation technique leads to highly variable and inappropriate extrapolated quantitative results. As an example, in the February 28, 2023 Valadez Report, a sample size of 0.000017 grams was used to extrapolate to 1 gram of Baby Powder—58,824 times extrapolation. Given the 0.0003 to 0.0006% chrysotile concentration claimed, a lenient 0.5% maximum allowed error, and a sample size of 0.000017 grams, the calculated Confidence Level is less than 50%, making the False Positive error rate greater than 50%. Such an irresponsible and unheard-of False Positive error rate is totally unacceptable as part of an analytical methodology. A responsible laboratory will never adopt such a sampling scheme to make the False Positive error rate greater than 50%. And such a methodology could never pass scrutiny to become an accepted method by any standards setting organization.

I describe this problem on pages 65 through 75 of **Exhibit C**.

4. MAS's Liquid Density Sample Preparation Procedures for "Chrysotile" are Inaccurate and Unreliable

2020 - 2024 HLS Resaults

Date	MAS No.			Light Fraction %
2020-09-17	**M71666**	**001**	**1**	17.0
			2	14.6
			3	13.4
2021-05-25	**M71216**	**001**	**1**	24.2
			2	21.4
			3	21.3
2023-02-28	**M71614**	**001**	**1**	15.9
2023-10-19	**M71643**	**001**	**1**	19.7
2024-02-15	**M71740**	**001**	**1**	25.7

While I have reviewed all of the reports included in **Exhibit B**, the above table includes the weight recovery fractions reported by MAS in a handful of Johnson's Baby Powder products over a five-year span. This small group of samples is illustrative of the high degree of variation in the sample preparation procedure as well as the inability of MAS's sample preparation procedure to effectively concentrate the "chrysotile" that it claims to find in Johnson's Baby Powder.

As shown in the table above, from 2020 to 2024 over a five year span using various different sample preparation techniques as described in MAS's reports, the heavy liquid separation sample preparation procedure produced a series of extremely inconsistent light fractions ranging from 13.4% to 24.2% in talcum powder products, which further produced "chrysotile" concentrations ranging from 0.003% to 0.01%. For Baby Powder samples consisting of 99.9% talcum powder, which should be in the heavy fraction, how possible is the light fraction more than 1%? It is beyond comprehension that

those ridiculous two-digit light fraction results did not make MAS realize something was grossly wrong with each and every sample preparation procedure that it tried over the course of five years.

The extremely high degree of volatility in weight recovery is not only a result of the deficiency in MAS's sample preparation procedure but also a clear indication of the non-existence of chrysotile. There is no chrysotile to concentrate regardless of the heavy liquid density separation process used.

I describe this problem on pages 76 and 77 of **Exhibit C.**

Conclusion

For the reasons stated above, I disagree with each and every single identification of "chrysotile" in Johnson's Baby Powder made by Dr. Longo's laboratory in the reports that I have reviewed. The data presented by MAS demonstrate systematic and chronic deficiencies in almost every aspect of operation, from the equipment setup and calibration to the sampling procedure, the sample preparation processes, the execution of the analytical procedure, and reporting quantification procedure, which leads me to conclude that the laboratory is incapable of performing the most basic aspects of PLM analytical procedure let alone correctly identifying chrysotile by PLM.

The following is a summary of MAS's systematic and chronic deficiencies:

- Inability to ensure a 95% Confidence Level of quantification.
- Inability to correctly interpret dispersion staining colors.
- Inability to calibrate dispersion staining colors.
- Inability to understand the relationship between the material's refractive index and the refractive index of liquids used for measurement.
- Inability to conduct calibrated visual estimate (CVE).
- Inability to check the internal consistency of analytical data.
- Inability to correctly measure particle size under a polarized light microscope.
- Inability to correctly create scale bars.
- Inability to understand the fundamental physics principles governing the relationship between a material's refractive index and physical dimension.
- Inability to understand the fundamental geological principles governing the formation of minerals and mineral ore deposits.

I hold all of the opinions that I expressed in this report and **Exhibit C** to a reasonable degree of scientific certainty.

By:_____
Dr. Shu-Chun Su

Date: May 21, 2024

Exhibit A – Biography

National Voluntary Laboratory Accreditation Program
National Institute of Standards and Technology
Department of Commerce
USA

Dr. Shu-Chun Su

Shu-Chun Su became an NVLAP Technical Expert for the Bulk and Airborne Asbestos Programs in 1988. Since then, he has conducted close to a thousand NVLAP on-site assessments of bulk and airborne asbestos laboratories in the USA, Canada, Japan, and Korea.

Skills and Expertise

Dr. Su is an accomplished expert in general and optical mineralogy, petrography, igneous and metamorphic petrology, geochemistry, crystal chemistry, powder and single crystal X-ray crystallography, digital image analysis, and various microscopy techniques, including polarized light microscopy, scanning electron microscopy, transmission electron microscopy, infra-red micro-spectroscopy, Raman micro-spectroscopy, confocal laser scanning microscopy, etc. Dr. Su's analytical approach to derive refractive indices at various wavelengths from dispersion staining data was recognized to be "Su's Method" by Professors R. E. Stoiber and S. A. Morse at Massachusetts University, Amherst, in "Crystal Identification with the Polarizing Microscope," Springer, 358pp, 1994. By applying this method to bulk asbestos analysis, he has developed a standardized procedure for rapidly and accurately determining refractive indices of asbestos fibers using the dispersion staining technique. The procedure has been used by more than 95% of asbestos laboratories in the USA, Canada, Japan, and Korea since 1994 and was formally published in 2003.

In the area of airborne asbestos analysis, Dr. Su has developed a computer program as well as detailed d-spacing and interfacial angle tables for the six regulated asbestos minerals plus winchite, richterite, and talc to assist the indexing and interpretation of zone-axis SAED (selected area electron diffraction) patterns. It's been widely used by airborne asbestos laboratories around the world.

Education, Work History, and Relevant Work Experience

Dr. Su obtained a B.S. in Geochemistry from Peking University, China, in 1964 and worked in the Central Laboratory, Geological Survey of Gansu Province for 17 years. After earning an M.S. in Mineralogy at the Institute of Geology and Geophysics, Chinese Academy of Sciences in 1981, Dr. Su came to the U.S. to pursue graduate study in crystal chemistry, optical crystallography, and silicate mineralogy with Professors F. Donald Bloss and Paul H. Ribbe at Virginia Polytechnic Institute and State University. After completing his Ph.D. in Geology/Mineralogy in 1985, he did post-doctoral research to develop an automated refractometer and joined Hercules Incorporated in 1987. Before his retirement in 2006, he was a Senior Research Scientist and Director of the Light and Electron Microscopy Laboratory at Hercules Research Center, Wilmington, Delaware. He is a Fellow of the Mineralogical Society of America.

Rev. 2024-02-22

29 Publications Relevant To Asbestos Analysis

2024 Su, S.C. The Unification of Becke Line and Dispersion Staining Techniques For the Determination of Refractive Index of Non-Opaque Materials. The Microscope. 70:3, 99–112. https://doi.org/10.59082/XCLR4173

2023 Su, S.C. The Calibration of Dispersion Staining Colors. The Microscope, 70:1, 3-21. https://doi.org/10.59082/HNQR9171

2022 Su, S.C. The Dispersion Staining Technique and Its Application to Measuring Refractive Indices of Non-opaque Materials, with Emphasis on Asbestos Analysis, The Microscope, 69:2, pp 51–69; https://doi.org/10.59082/ZGWM6676.

2022 Su, S.C. Area Percentage Charts to Aid Visual Estimation of Asbestos Concentration in Bulk Asbestos Samples. The Microscope, 69:4, 160-162. https://doi.org/10.59082/RPCG4507

2021 Su, S.C. Indexing and Interpretation of Zone-Axis SAED Patterns of Amphibole Asbestos Minerals in the Asbestos Analysis by Transmission Electron Microscopy. in Asbestos and Other Elongate Mineral Particles—New and Continuing Challenges in the 21st Century, ed. J. R. Millette and J. S. Webber (West Conshohocken, PA: ASTM International, 2021), 471–499. https://doi.org/10.1520/STP163220200071

2020 Su, S.C. A Comprehensive Suite of d-0 Look-Up Tables for Indexing Zone-Axis SAED Patterns of Amphibole Asbestos and Related Minerals. The Microscope, 68:3/4, 99-110, Appendix: Comprehensive Lattice Plane Spacing d and Interplanar Angle Tables of Asbestos and Talc Minerals. 888 pages

2014 Su, S.C. Can AHERA Bulk Asbestos Method Statistically Differentiate ACM from Non-ACM? Johnson Conference, July 21- 23, 2014. Burlington, Vermont.

2012 Su, S.C. Fundamental Flaws of AHERA Test Method for Determining Asbestos Concentration of Bulk Insulation Samples. Proceedings of Geological Society of America, Annual Meeting, November 4 - 7, 2012. Charlotte, North Carolina.

2005 Su, S.C. Analytical Sensitivity of Bulk Asbestos Analysis. Proceedings of 2005 ASTM Johnson Conference. July 18 - 22, 2005. Burlington, Vermont.

2005 Su, S.C. Dispersion Staining – A Versatile Complement to Becke Line Method for Refractive Index Determination. Special Supplement to Geochimica et Cosmochimica Acta, A727.

2004 Gunter, M.E., Weaver, R., Bandli, B.R., Bloss, F.D., Evans, S.H., and Su, S.C., Results from a McCrone spindle stage short course, a new version of EXCALIBR, and how to build a spindle stage. The Microscope, 52, 23-39.

2003 Su, S.C., A rapid and accurate procedure for the determination of refractive indices of asbestos minerals. American Mineralogist, 88, 1979-1982.

2001 Su, S.C., Applications of Dispersion Staining Technique in Image Analysis of Colorless Particles. Rieder, C. L., Ed., Proceedings of 59th Annual Meeting of the Microscopy Society of America, 817-818.

1993 Su, S.C., Determination of the refractive index of solids by dispersion staining method - An analytical approach. Rieder, C. L., Ed., Proceedings of 51st Annual Meeting of the Microscopy Society of America, 456-457.

1992 Su, S.C., Calibration of refractive index liquids using optical glass standards with dispersion staining technique. The Microscope, 40, 95-108.

1989 Gunter, M.E., Bloss, F.D., and Su, S.C., Computer programs for the spindle stage and double-variation method. The Microscope, 37, 167-171.

1988 Gunter, M.E., Bloss, F.D., and Su, S.C., EXCALIBR revisited. American Mineralogist, 73, 1481-1482.

1987 Peacor, D.R., Dunn, P.J., Su, S.C., and Innes, J., Ribbeite, a unit-cell twinned polymorph of alleghanyite and member of the leucophoenicite group from Kombat Mine, Namibia. American Mineralogist, 72, 213-216.

1987 Solie, D.N. and Su, S.C., An occurrence of barium-rich mica from Alaska Range. American Mineralogist, 72, 995-999.

1987 Dunn, P.J., Peacor, D.R., Ramik, R.A., Su, S.C., and Rouse, R.C., Franklinfurnaceite, a Ca-Mn-Fe3+-Zn layer silicate related to chlorite, from Franklin, New Jersey. American Mineralogist, 72, 812-815.

1987 Su, S.C., Bloss, F.D. and Gunter, M.E., Procedures and computer programs to refine the double variation method. American Mineralogist, 72, 1011-1013.

1987 Dunn, P.J., Peacor, D.R., Su, S.C., Wicks, F.J. and Parker, F.J., Parabrandite, the manganese analogue of talmessite, from Sterling Hill, Ogdensburg, New Jersey. Neues Jahrbuch fur Mineralogie, Abhandlungen, 157, 113-119.

1986 Su, S.C., Ribbe, P.H., and Bloss, F.D., and Warner, J.K., Optical properties of the high albite (analbite)-high sanidine solid solution series. American Mineralogist, 71, 1393-1398.

1986 Su, S.C., Ribbe, P.H., Bloss, F.D., and Goldsmith, J.R., Optical properties of single crystals in the order-disorder series low-high albite. American Mineralogist, 71, 1393-1398.

1986 Su, S.C., Ribbe, P.H., and Bloss, F.D., Alkali feldspars: Structural states determined from composition and optic axial angle 2V. American Mineralogist, 71, 1285-1296.

1986 Dunn, P.J., Peacor, D.R., Su, S.C., Nelen, J.A., and Knorring, O. von, Johninnesite, a new sodium manganese arsenosilicate from the Kombat Mine, Namibia. Mineralogical Magazine, 50, 667-670.

1984 Su, S.C., Bloss, F.D., Extinction angles for amphiboles or pyroxenes: A cautionary note. American Mineralogist, 69, 399-403.

1984 Su, S.C., Bloss, F.D., Ribbe, P.H., and Stewart, D.B., Optic axial angle, a precise measure of Al,Si ordering in T1 tetrahedral sites of K-rich feldspars. American Mineralogist, 71, 1384-1392.

1983 Bloss, F.D., Gunter, M., Su, S.C., and Wolfe, E.H., Gladstone-Dale constant: A new approach. Canadian Mineralogist, 21, 93-99.

2 Book Reviews Relevant to Asbestos Analysis

1989 Su, S.C., Introduction to Optical Mineralogy, by William D. Nesse, Oxford University Press, New York, 1986, 325p. American Mineralogist, 74, 506.

1986 Su, S.C., Optical Mineralogy, Second Edition, by David Shelley, Elsevier Science Publishing Co., Inc., New York, 1985, 321 p. American Mineralogist, 71, 1060.

28 Presentations Relevant to Asbestos Analysis

2017 Su, S.C., Instructor, Short Course on Optical Crystallography and The Spindle Stage. University of Idaho (January 30 – February 3, Moscow, Idaho)

2003 Su, S.C., Instructor, Short Course on Optical Crystallography and The Spindle Stage. INTER/MICRO-03 (July 11-13, Chicago, Illinois)

1999 Su, S.C., Instructor, Short Course on The Spindle Stage. INTER/MICRO-99 (July 2-3, Chicago, Illinois)

1998 Su, S.C., Estimating the Refractive Index Difference between a Solid Particle and an Immersion Liquid. INTER/MICRO-98 (August 10-14, Chicago, Illinois)

1997 Su, S.C., Improve the Proficiency in Asbestos Identification by Polarized Light Microscopy. The 15th Annual Conference of the Environmental Information Association (former National Asbestos Council), March 22 - 25, Las Vegas, Nevada.

1996 Su, S.C., Understanding Detection Limit and Analytical Sensitivity in TEM Airborne Asbestos Analysis. NVLAP Annual Regional Meetings (East Region: October 4, Philadelphia, PA; Central Region: October 25, Minneapolis, MN; West Region: November 1, San Francisco, CA)

1996 Su, S.C., Back to Basics for Bulk Asbestos Analysis. NVLAP Annual Regional Meetings (East Region: October 4, Philadelphia, PA; Central Region: October 25, Minneapolis, MN; West Region: November 1, San Francisco, CA)

1995 Su, S.C., Improving Accuracy in Refractive Index Measurement in Bulk Asbestos Analysis. NVLAP Annual Regional Meetings (East Region: September 15, Cincinnati, OH; Central Region: October 6, Houston, TX; West Region: October 27, Los Angeles, CA).

1995 Su, S.C., Identifying Tremolite, Actinolite, and Anthophyllite in Bulk Asbestos Samples. NVLAP Annual Regional Meetings (East Region: September 15, Cincinnati, OH; Central Region: October 6, Houston, TX; West Region: October 27, Los Angeles, CA).

1995 Su, S.C., Cooke, P.M., Perkins, R.L., and Harvey, B., Analysis of Bulk Materials for Asbestos: The Problems and Solutions. Professional Development Seminars, Environmental Management '95, the 12th Annual Conference of the Environmental Information Association (former National Asbestos Council), April 22-26, Tempa, Florida.

1994 Su, S.C., Measuring/recording refractive indices of asbestos fibers in NVLAP accredited environmental laboratories. NVLAP Annual Regional Meetings (West Region: June 29, Seattle, WA; Central Region: July 22, Chicago, IL; East Region: August 24, Gaithersburg, MD).

1994 Su, S.C., Determination of refractive indices of Asbestos Minerals. INTER/MICRO-94 (July 18-21, Chicago, Illinois).

1993 Su, S.C., Determination of the refractive index of solids by dispersion staining method - An analytical approach. 51st Annual Meeting of the Microscopy Society of America (July 31 - August 4, Cincinnati, Ohio).

1990 Su, S.C., A computer program for rapidly and accurately orienting single crystals by X-ray precession method. Symposium in Honor of Professor F. Donald Bloss (July 22-25, Blacksburg, Virginia).

1989 Su, S.C., Application of Spindle Stage to determining the birefringence of Synthetic fibers. The 28th Annual Meeting of Eastern Analytical Symposium (September 24-29, New York City, New York).

1989 Instructor, Short Course on Spindle Stage and Computer Methods. August 14-18. Offered jointly by McCone Research Institute and Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

1989 Instructor, Short Course on Immersion Methods and Crystal Optics. August 7 - 11. Offered jointly by McCrone Research Institute and Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

1986 Instructor, Short Course on Optical Identification of Crystals and Minerals. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

1986 Instructor, Short Course on Spindle Stage and Computer Methods. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

1986 Su, S.C., Ribbe, P.H., and Bloss, F.D., Optical, X-ray and microprobe study of low plagioclase single crystals: Discriminant analysis of discontinuities. The 14th General Meeting, the International Mineralogical Association (July 13-18, Stanford, California), Abstract with Programs, p.267.

1986 Su, S.C., Ribbe, P.H., and Bloss, F.D., Optical properties of alkali feldspars. Invited paper for the Symposium on Optical Properties of Minerals. The 14th General Meeting, the International Mineralogical Association (July 13-18, Stanford, California), Abstract with Programs, p.240.

1986 Su, S.C., Ribbe, P.H. and Bloss, F.D., Alkali feldspars: structural state determined from composition and optical angle 2V. The 99th Annual Meeting of Geological Society of America, Abstracts with Programs, 18, 766.

1985 Instructor, Short Course on Optical Identification of Crystals and Minerals. Virginia

Polytechnic Institute and State University, Blacksburg, Virginia.

1985 Instructor, Short Course on Spindle Stage and Computer Methods. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

1985 Su, S.C., Ribbe, P.H., and Bloss, F.D., Structural states and properties of a low-high albite series of single crystal. The 98th Annual Meeting of the Geological Society of America, Abstract with Programs, 17, 729.

1984 Warner, J.K., Su, S.C., Ribbe, P.H., and Bloss, F.D., Optical properties of the analbite-high sanidine solid solution series. The 97th Annual Meeting of Geological Society of America, Abstract with Programs, 16, 687.

1983 Su, S.C., Bloss, F.D., Ribbe, P.H., and Stewart, D.B., Optical axial angle, a precise measure of Al, Si content of the T1 tetrahedral sites in K-rich alkali feldspars. The 96th Annual Meeting of Geological Society of America Abstracts with Programs, 15, 701.

1983 Su, S.C., Bloss, F.D., Ribbe, P.H., and Stewart, D.B., Rapid and precise optical determination of Al, Si ordering in potassic feldspars. The 3rd NATO Advanced Study Institute on Feldspars, Feldspathoids and Their Paragenesis, June 26-July 6, Rennes, France.

Exhibit B – List of MAS Reports Reviewed in Which MAS Identifies "Chrysotile" by PLM in Johnson's Baby Powder Products

Date	MAS Project Number(s)
2/24/2020	M70484
3/6/2020	M66515 & M66516
3/18/2020	M71095
3/20/2020	M70877
4/6/2020	M71046
5/14/2020	M71095 Rev 1
9/16/2020	M71109-M71111
9/17/2020	M71166
9/23/2020	M71095 Rev 2
9/29/2020	M71166 Sup 1
12/8/2020	M71166 Sup 2
1/25/2021	M71211
2/9/2021	M71241
3/23/2021	M65329-013; M66507-001; M66508-001; M66509-001; M66513-001; M67420-001; M67420-002; M67420-004; M67420-005
4/13/2021	M71216
5/25/2021	M71228
6/4/2021	M70859
8/20/2021	M70877
3/11/2022	M71262
2/28/2023	M71614
10/19/2023	M71643
11/28/2023	M71730
2/15/2024	M71740

Exhibit C – Demonstrative Materials

IN RE JOHNSON & JOHNSON TALCUM POWDER PRODUCTS MARKETING, SALES PRACTICES, AND PRODUCTS LIABILITY LITIGATION

MDL NO. 16-2738 (FLW) (LHG)

MDL Report

Shu-Chun Su, Ph.D.

May 21, 2024

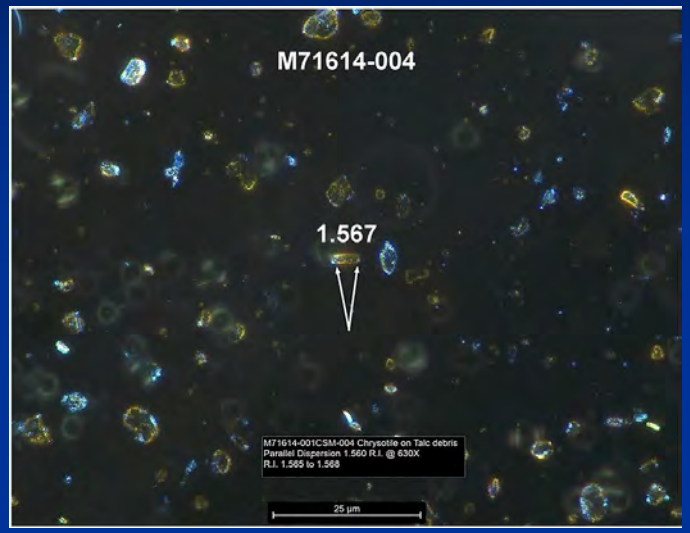
Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

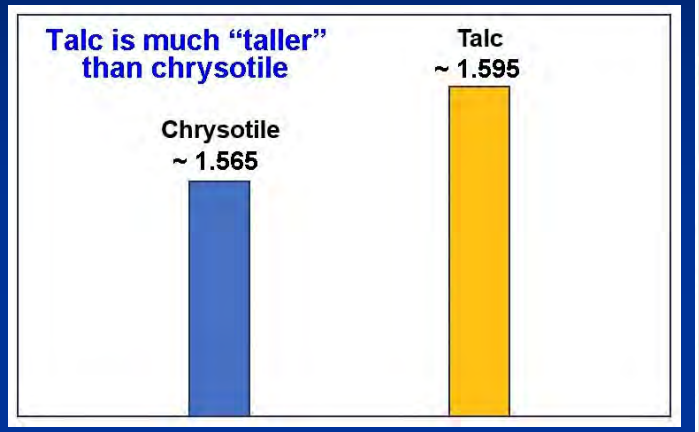
Incorrect RI Measurement Procedure: Suppressed Light Intensity

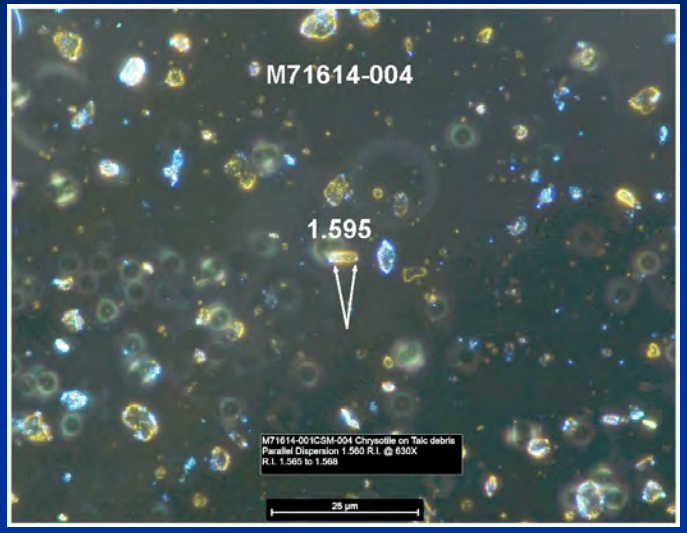
Incorrect RI Measurement Procedure

MAS Misidentified Talc as Chrysotile

2023-02-28 - Valadez Bottle Report

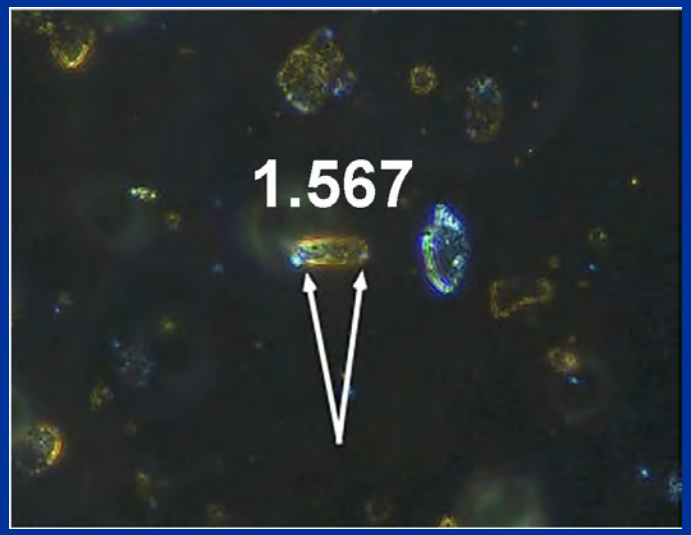


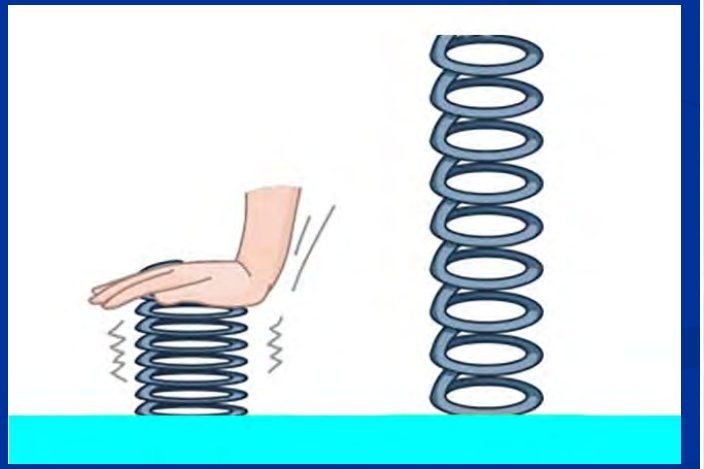


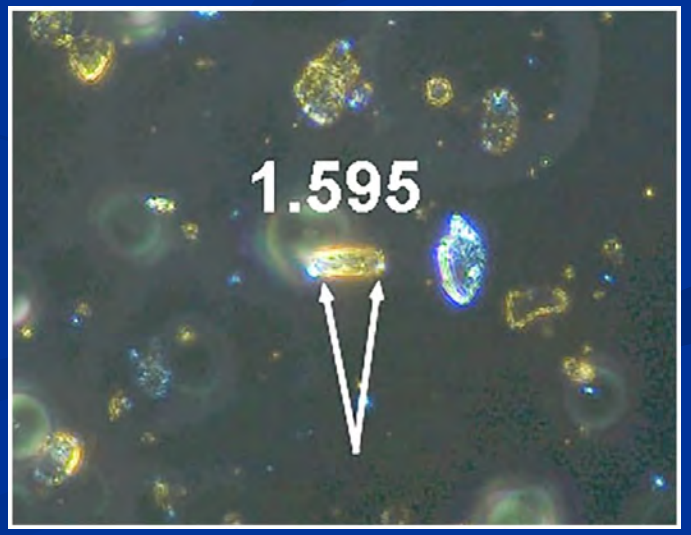


Suppressed

Unsuppressed



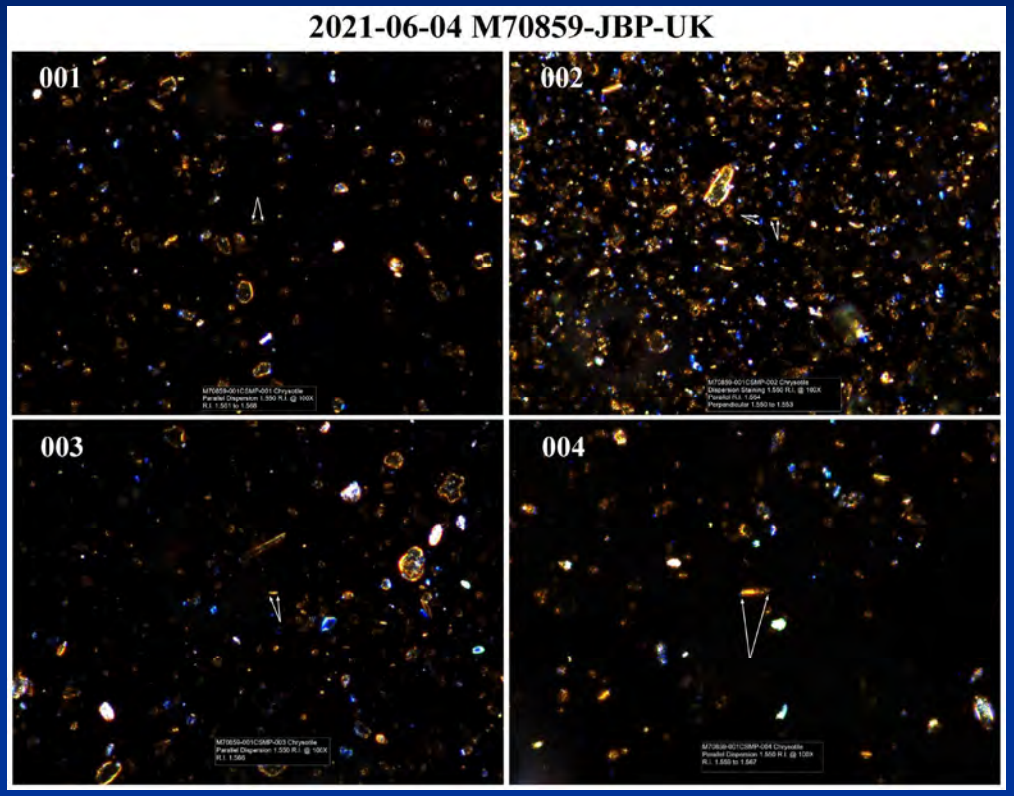




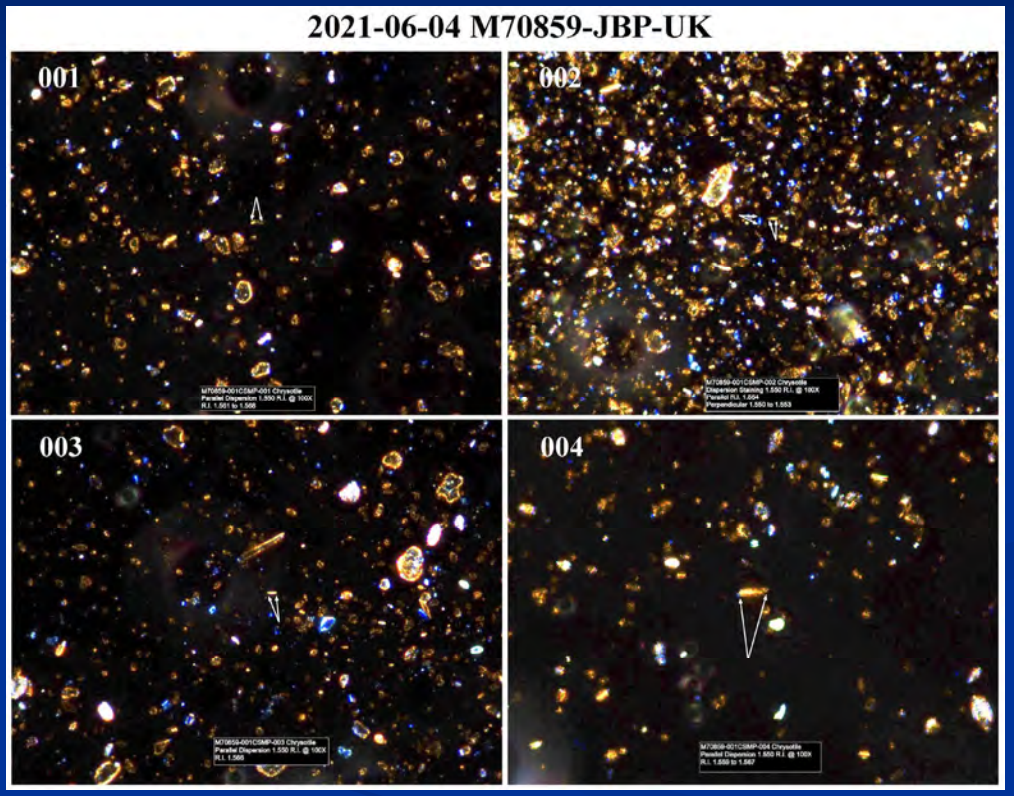
Another Example of MAS's Suppressed Illumination

2021-06-04 M70859 JPB-UK

Original illumination was suppressed



Illumination unsuppressed

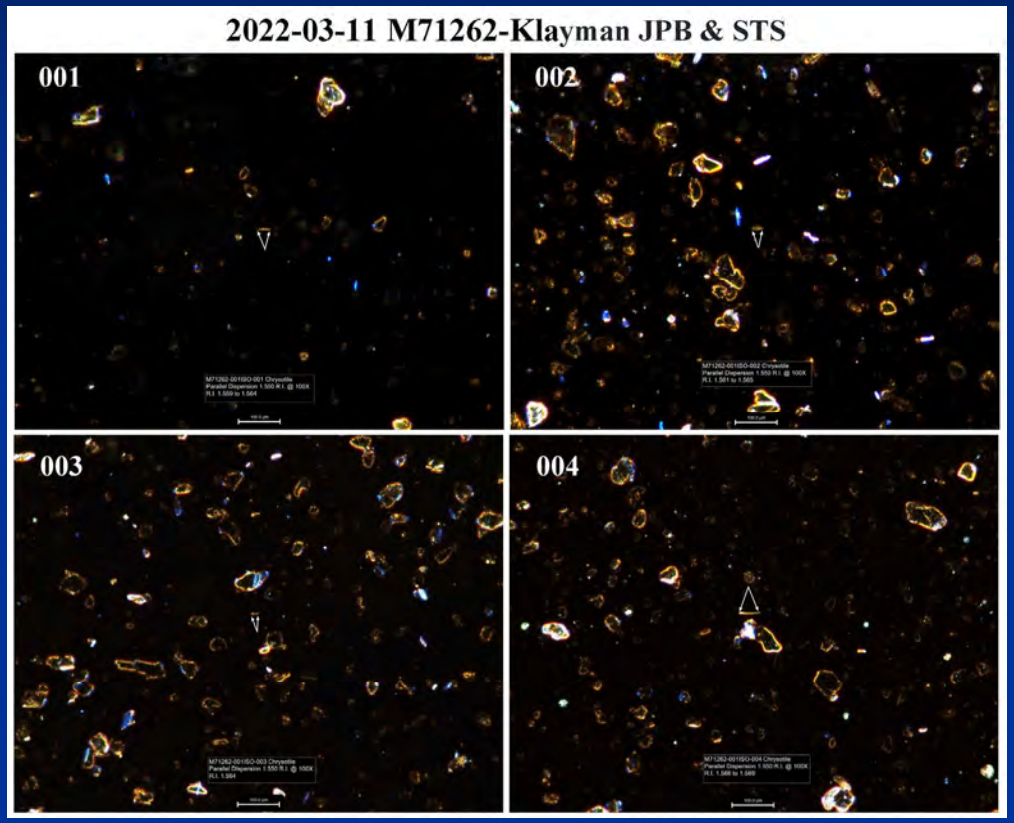


Correct analysis can only be conducted when the illumination is unsuppressed.

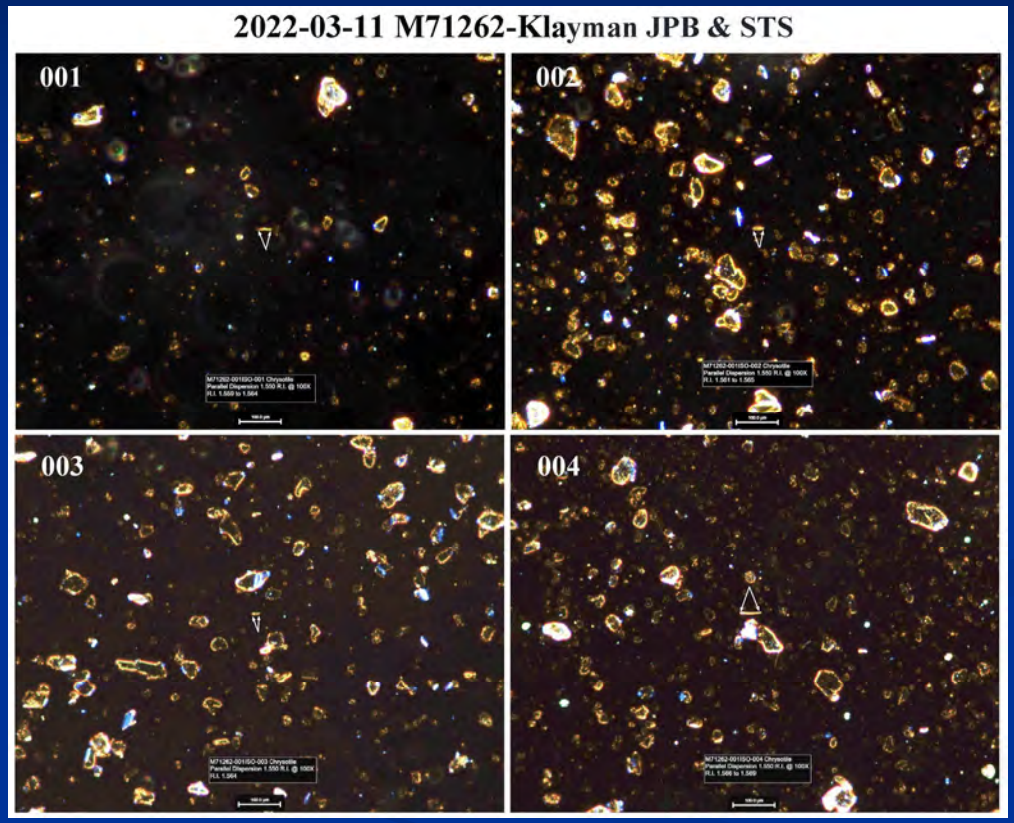
One More Example of MAS's Suppressed Illumination

2022-03-11 M71612 Klayman JPB & STS

Original illumination was suppressed



Illumination unsuppressed



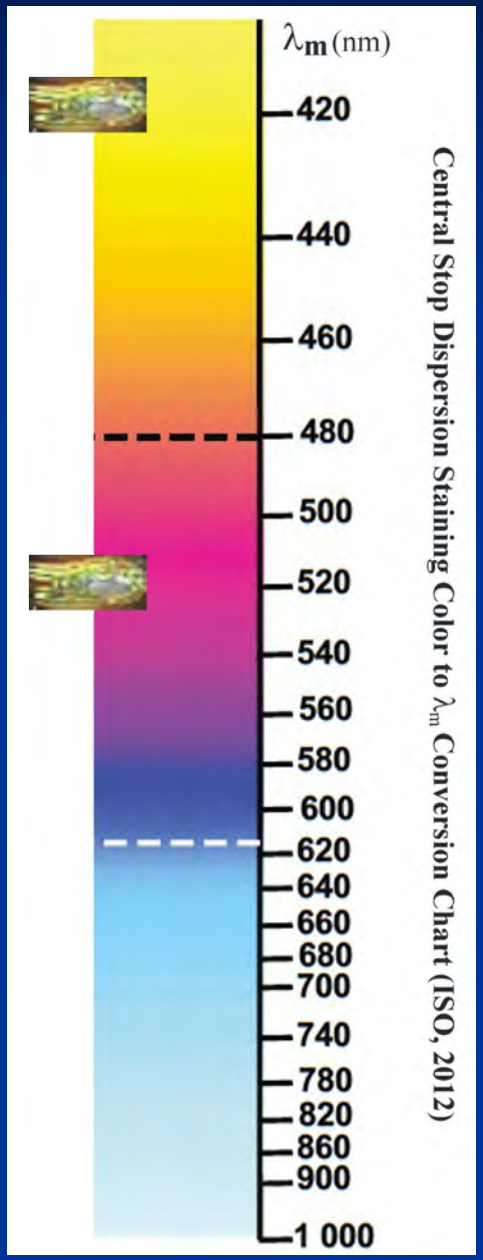
Correct analysis can only be conducted when the illumination is unsuppressed.

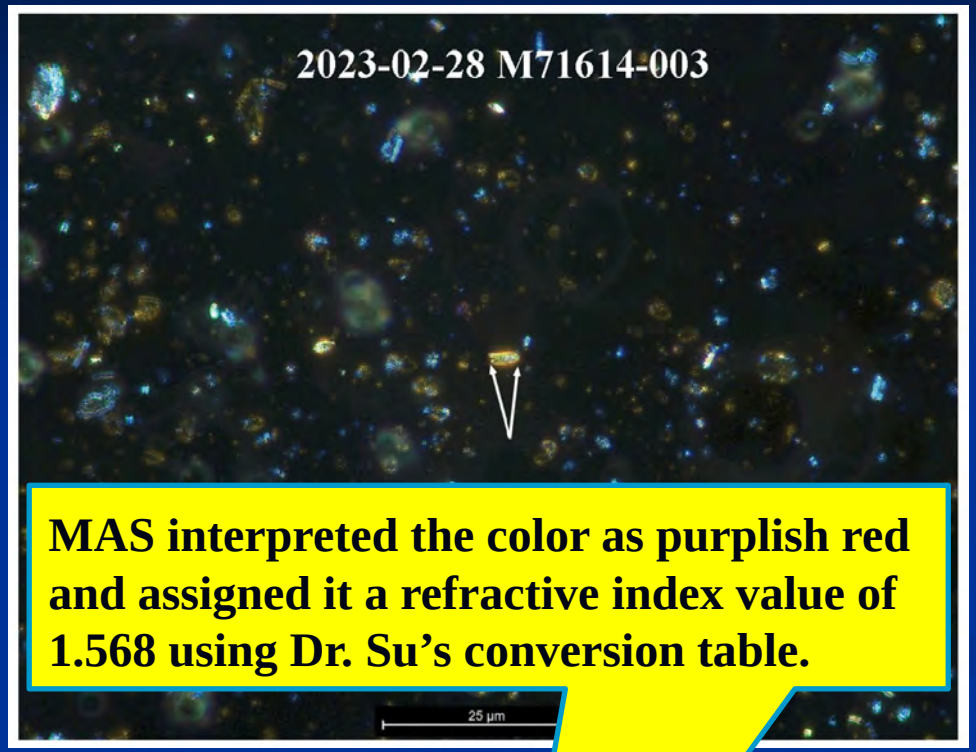
Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

Incorrect RI Measurement Procedure:
Inaccurate RI Values

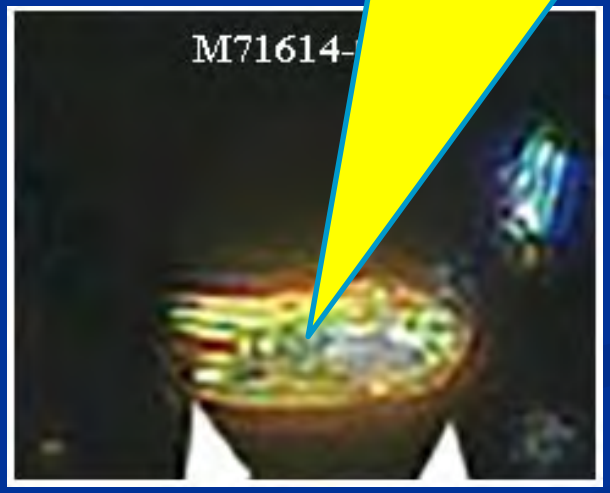
Incorrect RI Measurement Procedure

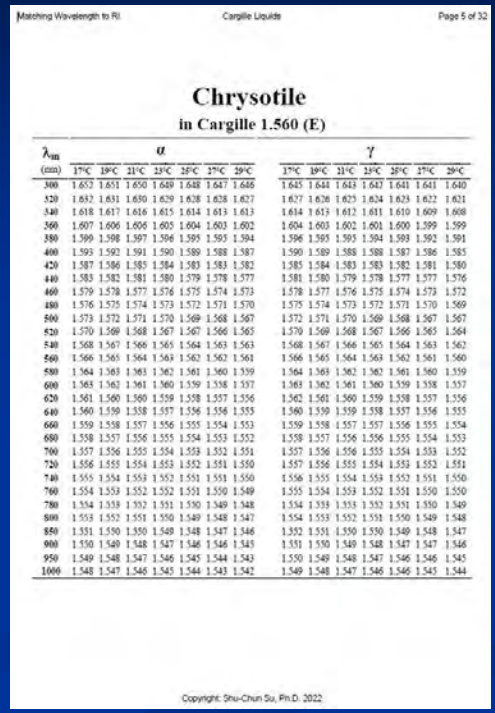
2023-02-28 - Valadez Bottle Report





MAS interpreted the color as purplish red and assigned it a refractive index value of 1.568 using Dr. Su's conversion table.




Matching Wavelength to RI — Cargille Liquids — Page 5 of 32

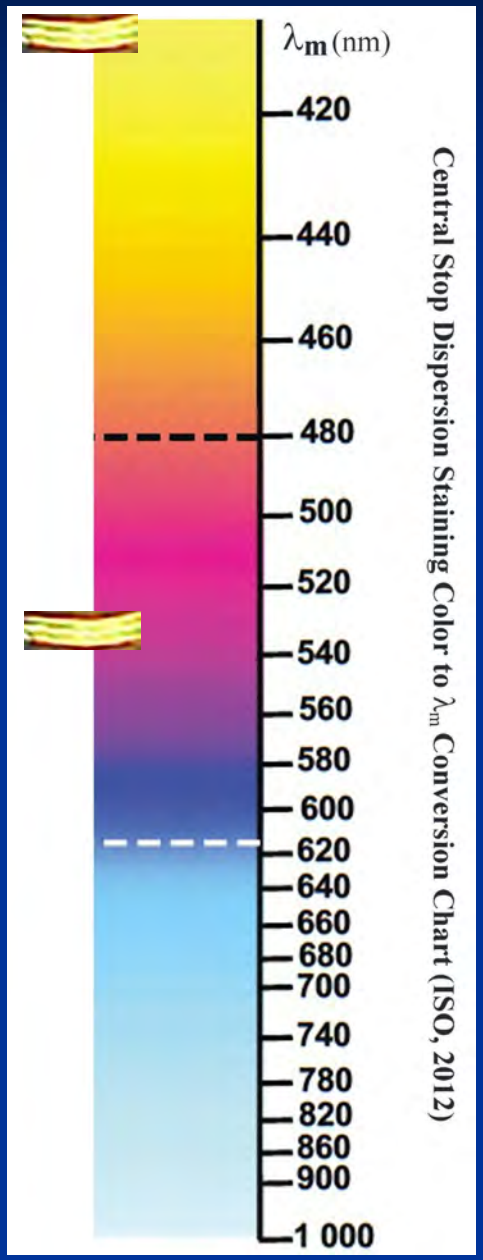
Chrysotile
in Cargille 1.560 (E)

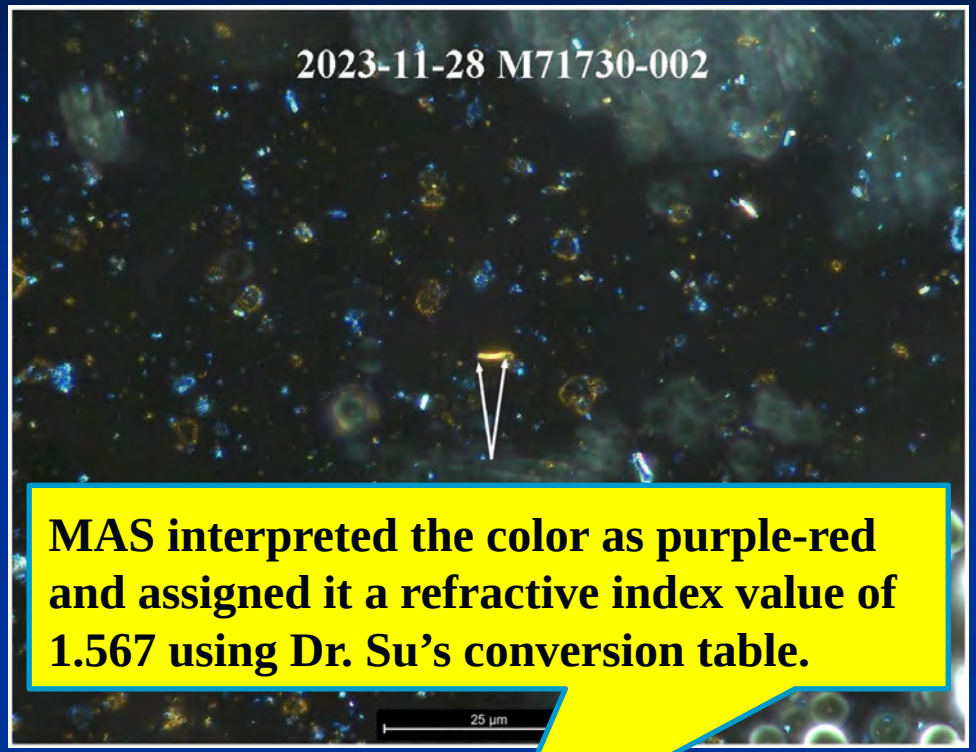
λ_m (nm)	α 17°C	α 19°C	α 21°C	α 23°C	α 25°C	α 27°C	α 29°C	γ 17°C	γ 19°C	γ 21°C	γ 23°C	γ 25°C	γ 27°C	γ 29°C
500	1.652	1.651	1.650	1.649	1.648	1.647	1.646	1.645	1.644	1.643	1.642	1.641	1.641	1.640
520	1.632	1.631	1.630	1.629	1.628	1.628	1.627	1.627	1.626	1.625	1.624	1.623	1.622	1.621
540	1.618	1.617	1.616	1.615	1.614	1.613	1.613	1.614	1.613	1.612	1.611	1.610	1.609	1.608
560	1.607	1.606	1.606	1.605	1.604	1.603	1.602	1.604	1.603	1.602	1.601	1.600	1.599	1.599
580	1.599	1.598	1.597	1.596	1.595	1.595	1.594	1.596	1.595	1.595	1.594	1.593	1.592	1.591
600	1.593	1.592	1.591	1.590	1.589	1.588	1.587	1.590	1.589	1.588	1.588	1.587	1.586	1.585
620	1.587	1.586	1.585	1.584	1.583	1.583	1.582	1.585	1.584	1.583	1.583	1.582	1.581	1.580
640	1.583	1.582	1.581	1.580	1.579	1.578	1.577	1.581	1.580	1.579	1.578	1.577	1.577	1.576
660	1.579	1.578	1.577	1.576	1.575	1.574	1.573	1.578	1.577	1.576	1.575	1.574	1.573	1.572
680	1.576	1.575	1.574	1.573	1.572	1.571	1.570	1.575	1.574	1.573	1.572	1.571	1.570	1.569
700	1.573	1.572	1.571	1.570	1.569	1.568	1.567	1.572	1.571	1.570	1.569	1.568	1.567	1.567
720	1.570	1.569	1.568	1.567	1.567	1.566	1.565	1.570	1.569	1.568	1.567	1.566	1.565	1.564
740	1.568	1.567	1.566	1.565	1.564	1.563	1.563	1.568	1.567	1.566	1.565	1.564	1.563	1.562
760	1.566	1.565	1.564	1.563	1.562	1.562	1.561	1.566	1.565	1.564	1.563	1.562	1.561	1.560
780	1.564	1.563	1.563	1.562	1.561	1.560	1.559	1.564	1.563	1.562	1.562	1.561	1.560	1.559
800	1.563	1.562	1.561	1.560	1.559	1.558	1.557	1.563	1.562	1.561	1.560	1.559	1.558	1.557
820	1.561	1.560	1.560	1.559	1.558	1.557	1.556	1.562	1.561	1.560	1.559	1.558	1.557	1.556
840	1.560	1.559	1.558	1.557	1.556	1.556	1.555	1.560	1.559	1.559	1.558	1.557	1.556	1.555
860	1.559	1.558	1.557	1.556	1.555	1.554	1.553	1.559	1.558	1.557	1.557	1.556	1.555	1.554
880	1.558	1.557	1.556	1.555	1.554	1.553	1.552	1.558	1.557	1.556	1.556	1.555	1.554	1.553
900	1.557	1.556	1.555	1.554	1.553	1.552	1.551	1.557	1.556	1.556	1.555	1.554	1.553	1.552
920	1.556	1.555	1.554	1.553	1.552	1.551	1.550	1.557	1.556	1.555	1.554	1.553	1.552	1.551
940	1.555	1.554	1.553	1.552	1.551	1.551	1.550	1.556	1.555	1.554	1.553	1.552	1.551	1.550
960	1.554	1.553	1.552	1.552	1.551	1.550	1.549	1.555	1.554	1.553	1.552	1.551	1.550	1.550
980	1.554	1.553	1.552	1.551	1.550	1.549	1.548	1.554	1.553	1.553	1.552	1.551	1.550	1.549
1000	1.553	1.552	1.551	1.550	1.549	1.548	1.547	1.554	1.553	1.552	1.551	1.550	1.549	1.548
850	1.551	1.550	1.550	1.549	1.548	1.547	1.546	1.552	1.551	1.550	1.550	1.549	1.548	1.547
900	1.550	1.549	1.548	1.547	1.546	1.546	1.545	1.551	1.550	1.549	1.548	1.547	1.547	1.546
950	1.549	1.548	1.547	1.546	1.545	1.544	1.543	1.550	1.549	1.548	1.547	1.546	1.546	1.545
1000	1.548	1.547	1.546	1.545	1.544	1.543	1.542	1.549	1.548	1.547	1.546	1.546	1.545	1.544

M71614-003's pale yellow dispersion staining color corresponds to a matching wavelength of 410 nm, which is conversed to an RI of 1.593, indicating it is the γ' of talc.

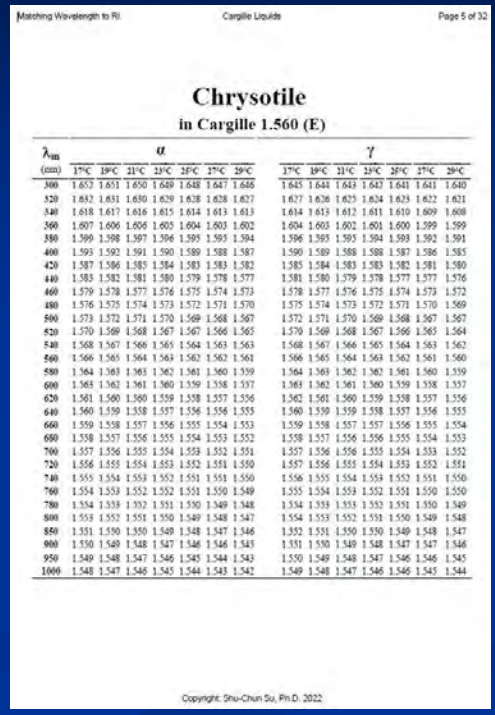
Incorrect RI Measurement Procedure

2023-11-28 - Henderson-Longo Supp. J&J Report





MAS interpreted the color as purple-red and assigned it a refractive index value of 1.567 using Dr. Su's conversion table.


Matching Wavelength to RI — Cargille Liquids — Page 5 of 32

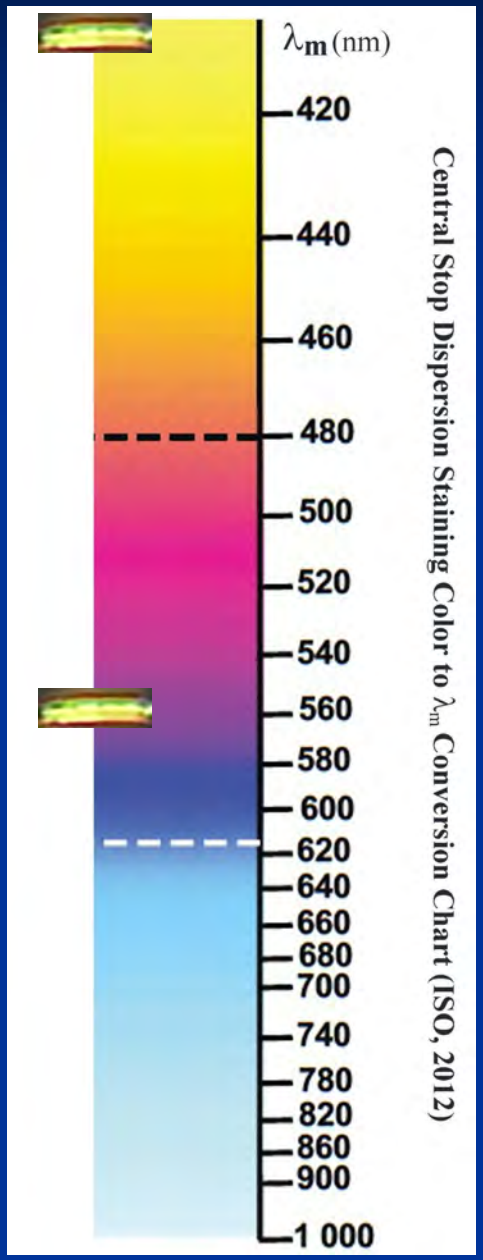
Chrysotile
in Cargille 1.560 (E)

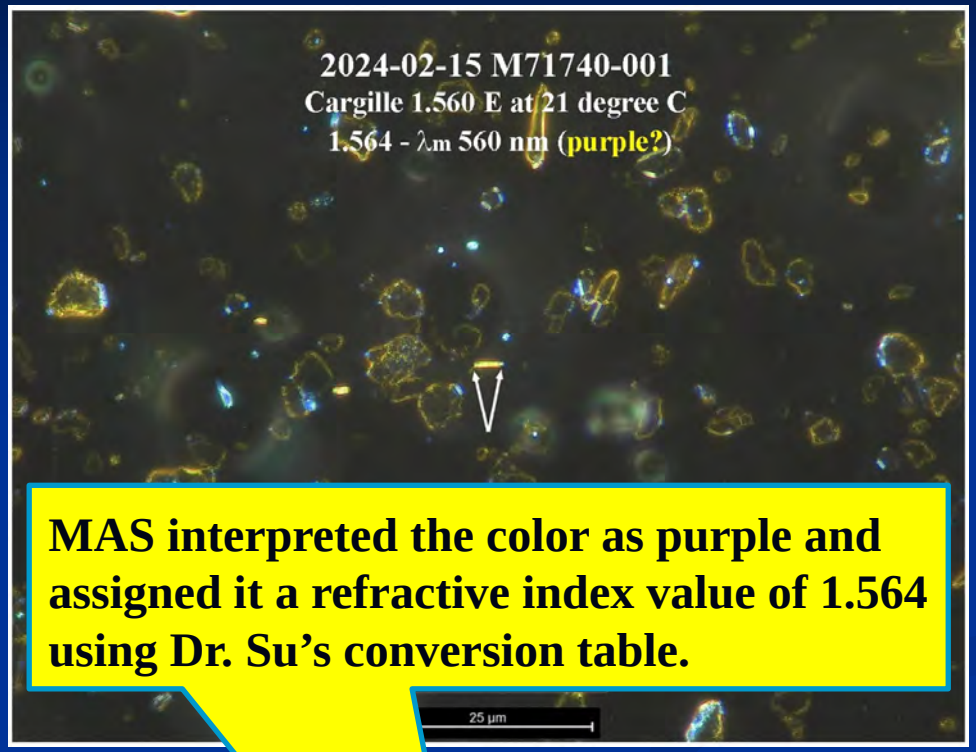
λ_m (nm)	α 17°C	α 19°C	α 21°C	α 23°C	α 25°C	α 27°C	α 29°C	γ 17°C	γ 19°C	γ 21°C	γ 23°C	γ 25°C	γ 27°C	γ 29°C
500	1.652	1.651	1.650	1.649	1.648	1.647	1.646	1.645	1.644	1.643	1.642	1.641	1.641	1.640
520	1.632	1.631	1.630	1.629	1.628	1.628	1.627	1.627	1.626	1.625	1.624	1.623	1.622	1.621
540	1.618	1.617	1.616	1.615	1.614	1.613	1.613	1.614	1.613	1.612	1.611	1.610	1.609	1.608
560	1.607	1.606	1.606	1.605	1.604	1.603	1.602	1.604	1.603	1.602	1.601	1.600	1.599	1.599
580	1.599	1.598	1.597	1.596	1.595	1.595	1.594	1.596	1.595	1.595	1.594	1.593	1.592	1.591
600	1.593	1.592	1.591	1.590	1.589	1.588	1.587	1.590	1.589	1.588	1.588	1.587	1.586	1.585
620	1.587	1.586	1.585	1.584	1.583	1.583	1.582	1.585	1.584	1.583	1.583	1.582	1.581	1.580
640	1.583	1.582	1.581	1.580	1.579	1.578	1.577	1.581	1.580	1.579	1.578	1.577	1.577	1.576
660	1.579	1.578	1.577	1.576	1.575	1.574	1.573	1.578	1.577	1.576	1.575	1.574	1.573	1.572
680	1.576	1.575	1.574	1.573	1.572	1.571	1.570	1.575	1.574	1.573	1.572	1.571	1.570	1.569
700	1.573	1.572	1.571	1.570	1.569	1.568	1.567	1.572	1.571	1.570	1.569	1.568	1.567	1.567
720	1.570	1.569	1.568	1.567	1.567	1.566	1.565	1.570	1.569	1.568	1.567	1.566	1.565	1.564
740	1.568	1.567	1.566	1.565	1.564	1.563	1.563	1.568	1.567	1.566	1.565	1.564	1.563	1.562
760	1.566	1.565	1.564	1.563	1.562	1.562	1.561	1.566	1.565	1.564	1.563	1.562	1.561	1.560
780	1.564	1.563	1.563	1.562	1.561	1.560	1.559	1.564	1.563	1.562	1.562	1.561	1.560	1.559
800	1.563	1.562	1.561	1.560	1.559	1.558	1.557	1.563	1.562	1.561	1.560	1.559	1.558	1.557
820	1.561	1.560	1.560	1.559	1.558	1.557	1.556	1.562	1.561	1.560	1.559	1.558	1.557	1.556
840	1.560	1.559	1.558	1.557	1.556	1.556	1.555	1.560	1.559	1.559	1.558	1.557	1.556	1.555
860	1.559	1.558	1.557	1.556	1.555	1.554	1.553	1.559	1.558	1.557	1.557	1.556	1.555	1.554
880	1.558	1.557	1.556	1.555	1.554	1.553	1.552	1.558	1.557	1.556	1.556	1.555	1.554	1.553
900	1.557	1.556	1.555	1.554	1.553	1.552	1.551	1.557	1.556	1.556	1.555	1.554	1.553	1.552
920	1.556	1.555	1.554	1.553	1.552	1.551	1.550	1.557	1.556	1.555	1.554	1.553	1.552	1.551
940	1.555	1.554	1.553	1.552	1.551	1.551	1.550	1.556	1.555	1.554	1.553	1.552	1.551	1.550
960	1.554	1.553	1.552	1.552	1.551	1.550	1.549	1.555	1.554	1.553	1.552	1.551	1.550	1.550
980	1.554	1.553	1.552	1.551	1.550	1.549	1.548	1.554	1.553	1.553	1.552	1.551	1.550	1.549
1000	1.553	1.552	1.551	1.550	1.549	1.548	1.547	1.554	1.553	1.552	1.551	1.550	1.549	1.548
850	1.551	1.550	1.550	1.549	1.548	1.547	1.546	1.552	1.551	1.550	1.550	1.549	1.548	1.547
900	1.550	1.549	1.548	1.547	1.546	1.546	1.545	1.551	1.550	1.549	1.548	1.547	1.547	1.546
950	1.549	1.548	1.547	1.546	1.545	1.544	1.543	1.550	1.549	1.548	1.547	1.546	1.546	1.545
1000	1.548	1.547	1.546	1.545	1.544	1.543	1.542	1.549	1.548	1.547	1.546	1.546	1.545	1.544

M71730-002's pale yellow dispersion staining color corresponds to a matching wavelength of 400 nm, which is conversed to an RI of 1.597, indicating it is the γ' of talc.

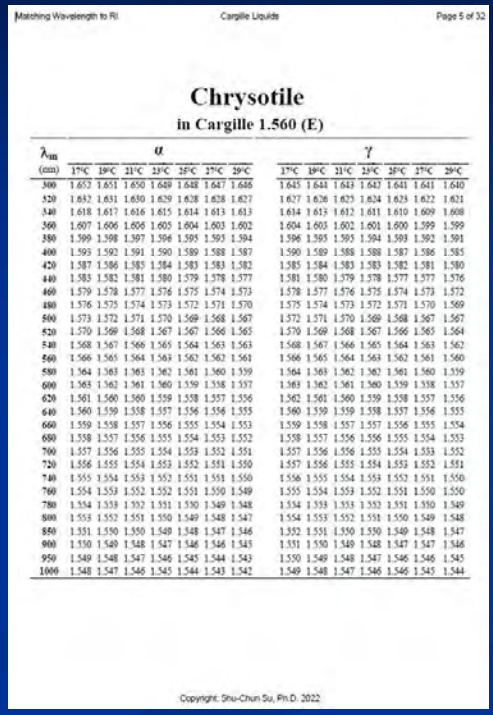
Incorrect RI Measurement Procedure

2024-02-15 M71740 Analysis of JBP (Rochelle Kirch) Compiled Notebook





MAS interpreted the color as purple and assigned it a refractive index value of 1.564 using Dr. Su's conversion table.



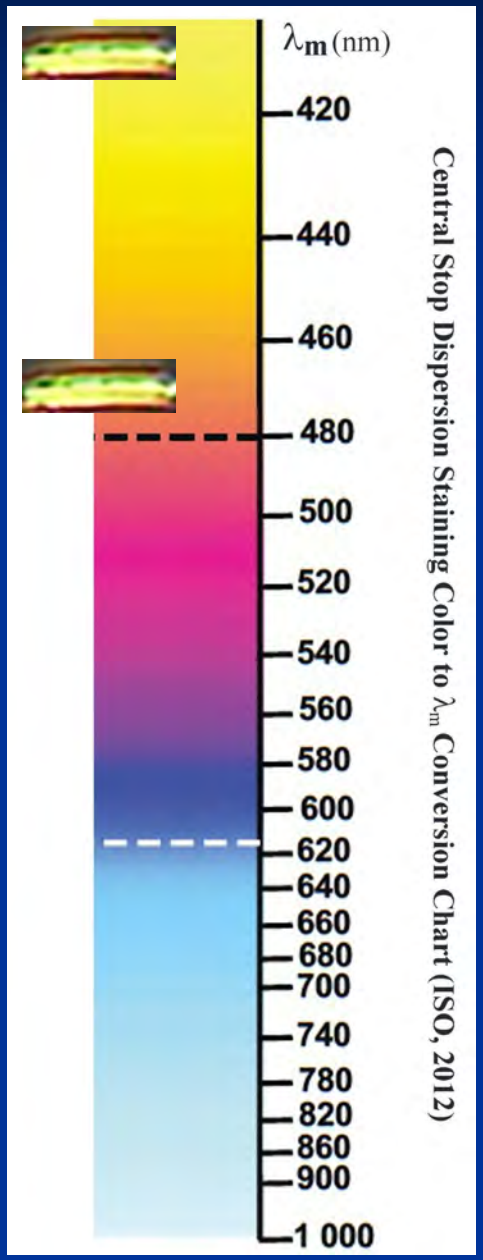
M71740-001's pale yellow dispersion staining color corresponds to a matching wavelength of 400 nm, which is conversed to an RI of 1.597, indicating it is the γ' of talc.

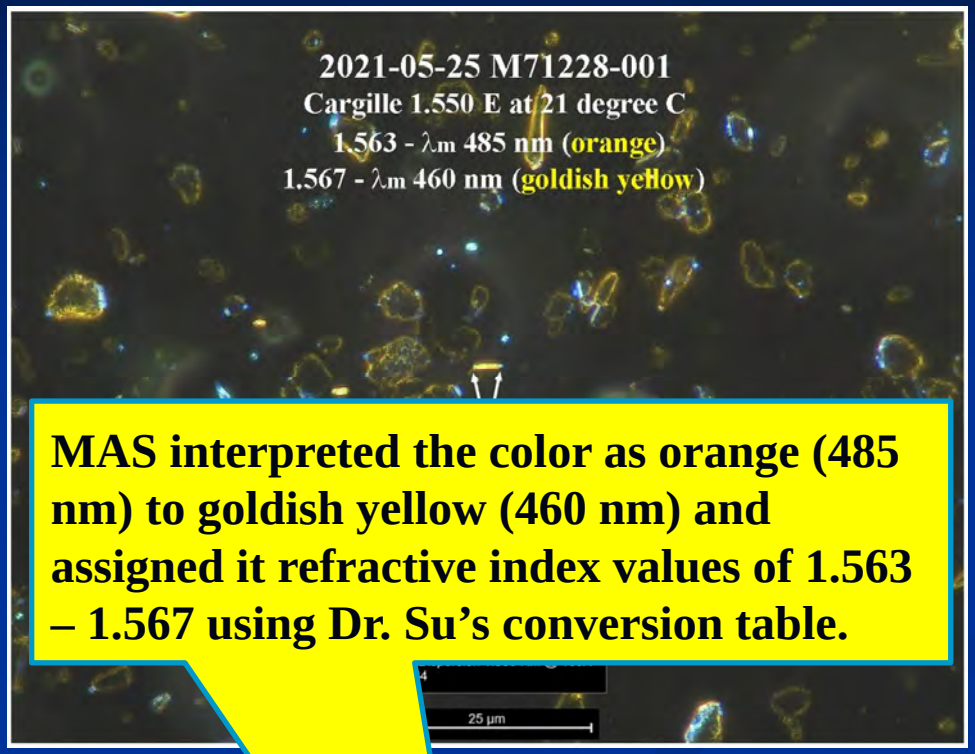
Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

Incorrect RI Measurement Procedure: Problem Persists for Years

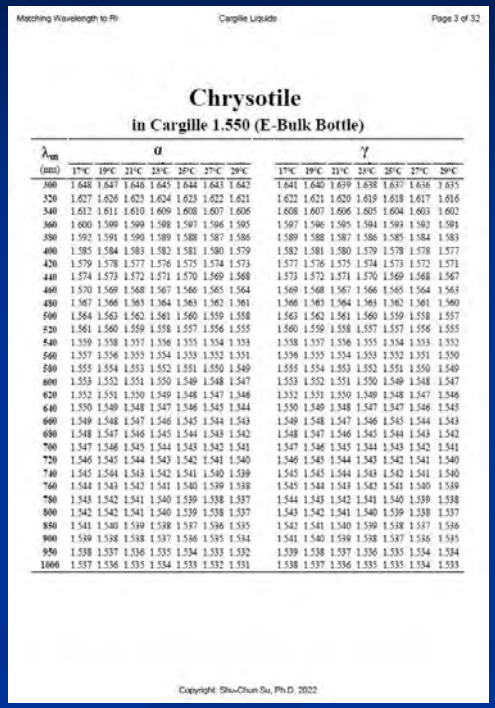
Incorrect RI Measurement Procedure

2021-05-25 M71228 OTShelf JBP Purchased Argentina





MAS interpreted the color as orange (485 nm) to goldish yellow (460 nm) and assigned it refractive index values of 1.563 – 1.567 using Dr. Su's conversion table.



Chrysotile
in Cargille 1.550 (E-Bulk Bottle)

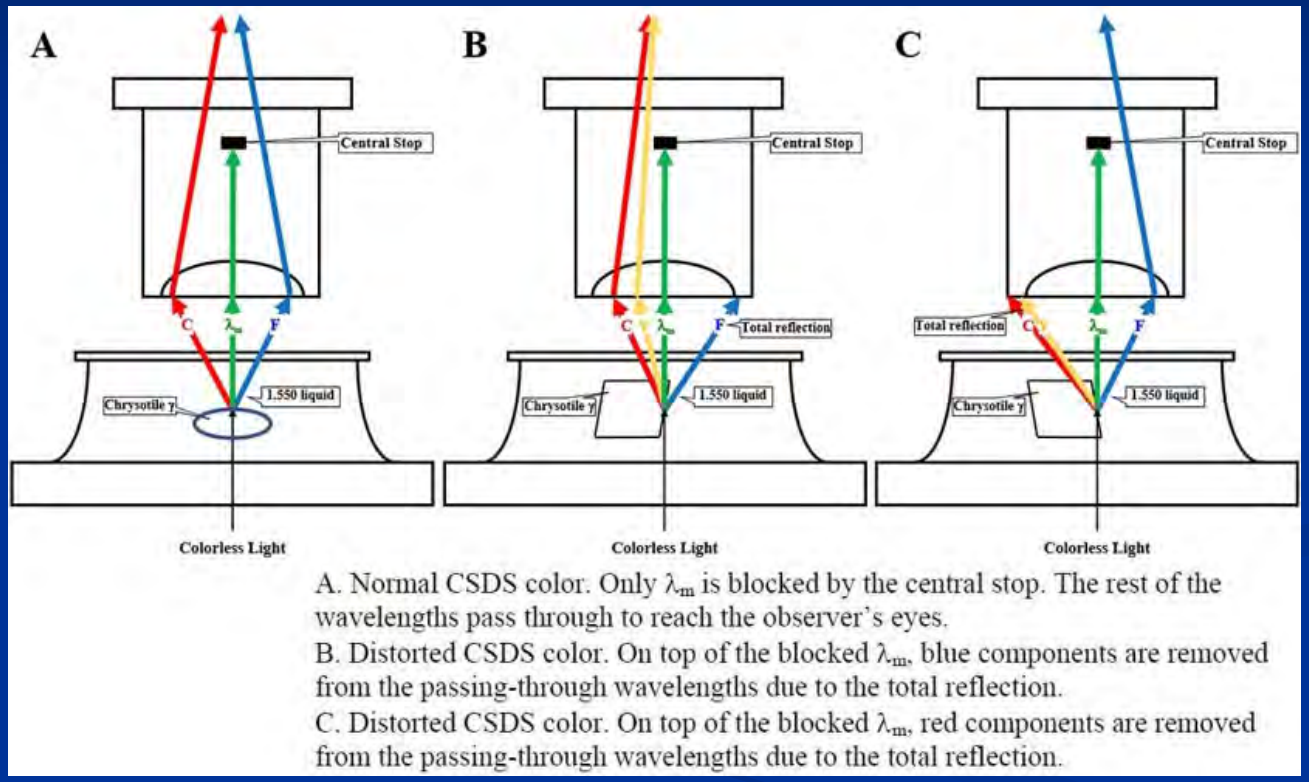
λ_{nm}	α							γ						
(nm)	17°C	19°C	21°C	23°C	25°C	27°C	29°C	17°C	19°C	21°C	23°C	25°C	27°C	29°C
360	1.648	1.647	1.646	1.645	1.644	1.643	1.642	1.641	1.640	1.639	1.638	1.637	1.636	1.635
320	1.627	1.626	1.625	1.624	1.623	1.622	1.621	1.622	1.621	1.620	1.619	1.618	1.617	1.616
340	1.612	1.611	1.610	1.609	1.608	1.607	1.606	1.608	1.607	1.606	1.605	1.604	1.603	1.602
360	1.600	1.599	1.599	1.598	1.597	1.596	1.595	1.597	1.596	1.595	1.594	1.593	1.592	1.591
380	1.592	1.591	1.590	1.589	1.588	1.587	1.586	1.589	1.588	1.587	1.586	1.585	1.584	1.583
400	1.585	1.584	1.583	1.582	1.581	1.580	1.579	1.582	1.581	1.580	1.579	1.578	1.578	1.577
420	1.579	1.578	1.577	1.576	1.575	1.574	1.573	1.577	1.576	1.575	1.574	1.573	1.572	1.571
440	1.574	1.573	1.572	1.571	1.570	1.569	1.568	1.573	1.572	1.571	1.570	1.569	1.568	1.567
460	1.570	1.569	1.568	1.567	1.566	1.565	1.564	1.569	1.568	1.567	1.566	1.565	1.564	1.563
480	1.567	1.566	1.565	1.564	1.563	1.562	1.561	1.566	1.565	1.564	1.563	1.562	1.561	1.560
500	1.564	1.563	1.562	1.561	1.560	1.559	1.558	1.563	1.562	1.561	1.560	1.559	1.558	1.557
520	1.561	1.560	1.559	1.558	1.557	1.556	1.555	1.560	1.559	1.558	1.557	1.557	1.556	1.555
540	1.559	1.558	1.557	1.556	1.555	1.554	1.553	1.558	1.557	1.556	1.555	1.554	1.553	1.552
560	1.557	1.556	1.555	1.554	1.553	1.552	1.551	1.556	1.555	1.554	1.553	1.552	1.551	1.550
580	1.555	1.554	1.553	1.552	1.551	1.550	1.549	1.555	1.554	1.553	1.552	1.551	1.550	1.549
600	1.553	1.552	1.551	1.550	1.549	1.548	1.547	1.553	1.552	1.551	1.550	1.549	1.548	1.547
620	1.552	1.551	1.550	1.549	1.548	1.547	1.546	1.552	1.551	1.550	1.549	1.548	1.547	1.546
640	1.550	1.549	1.548	1.547	1.546	1.545	1.544	1.550	1.549	1.548	1.547	1.547	1.546	1.545
660	1.549	1.548	1.547	1.546	1.545	1.544	1.543	1.549	1.548	1.547	1.546	1.545	1.544	1.543
680	1.548	1.547	1.546	1.545	1.544	1.543	1.542	1.548	1.547	1.546	1.545	1.544	1.543	1.542
700	1.547	1.546	1.545	1.544	1.543	1.542	1.541	1.547	1.546	1.545	1.544	1.543	1.542	1.541
720	1.546	1.545	1.544	1.543	1.542	1.541	1.540	1.546	1.545	1.544	1.543	1.542	1.541	1.540
740	1.545	1.544	1.543	1.542	1.541	1.540	1.539	1.545	1.545	1.544	1.543	1.542	1.541	1.540
760	1.544	1.543	1.542	1.541	1.540	1.539	1.538	1.545	1.544	1.543	1.542	1.541	1.540	1.539
780	1.543	1.542	1.541	1.540	1.539	1.538	1.537	1.544	1.543	1.542	1.541	1.540	1.539	1.538
800	1.542	1.542	1.541	1.540	1.539	1.538	1.537	1.543	1.542	1.541	1.540	1.539	1.538	1.537
850	1.541	1.540	1.539	1.538	1.537	1.536	1.535	1.542	1.541	1.540	1.539	1.538	1.537	1.536
900	1.539	1.538	1.538	1.537	1.536	1.535	1.534	1.541	1.540	1.539	1.538	1.537	1.536	1.535
950	1.538	1.537	1.536	1.535	1.534	1.533	1.532	1.539	1.538	1.537	1.536	1.535	1.534	1.534
1000	1.537	1.536	1.535	1.534	1.533	1.532	1.531	1.538	1.537	1.536	1.535	1.535	1.534	1.533

M71228-001's pale yellow dispersion staining color corresponds to a matching wavelength of 400 nm, which is conversed to an RI of 1.597, indicating it is the γ' of talc.

Incorrect RI Measurement Procedure

The variation of dispersion staining color is due to the total reflection

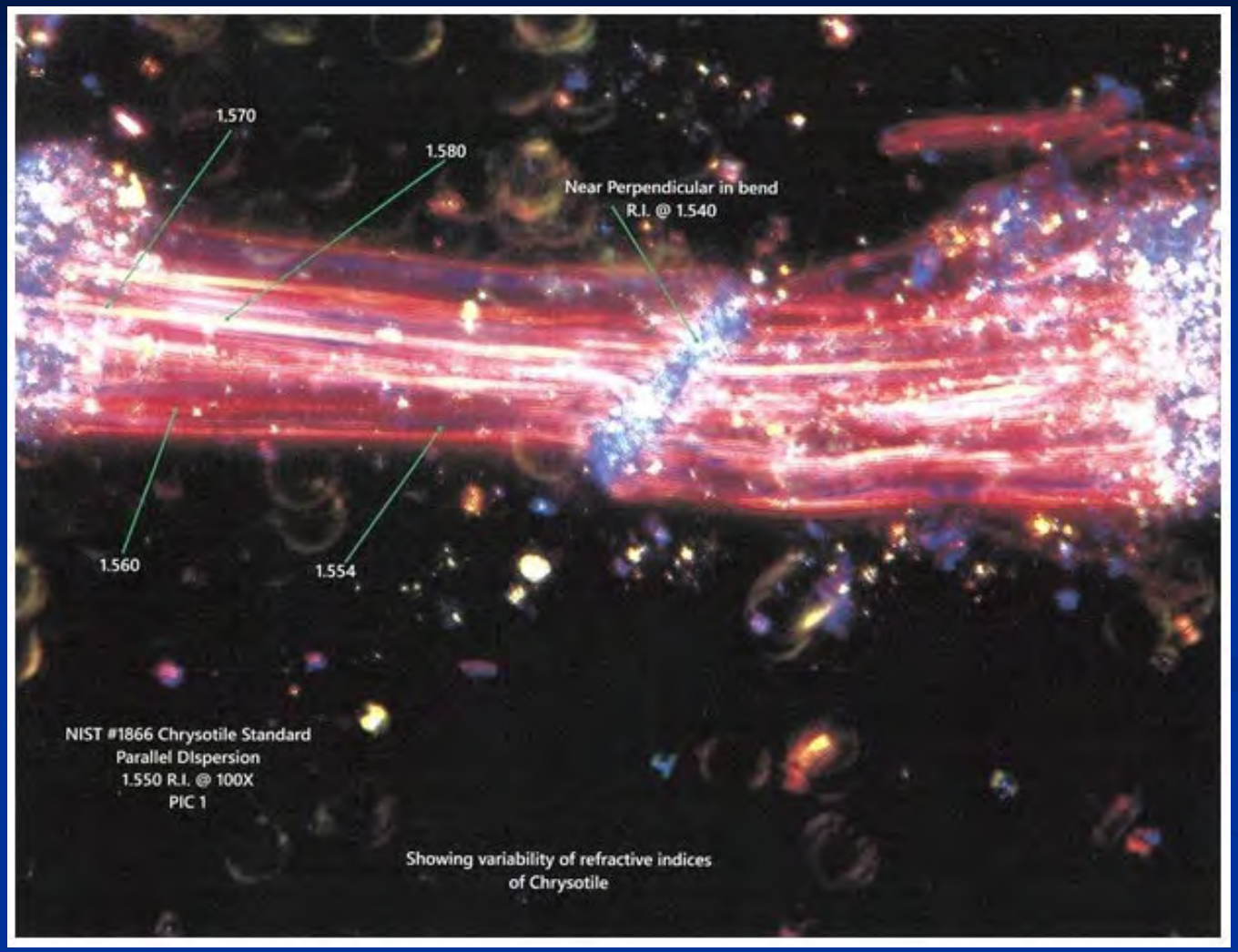
It is wrong for MAS to interpret the purple-red CSDS color at the edge as the representative color for the RI assignment because it fits the inaccurate chrysotile theory. It is a distorted CS color due to total reflection at the liquid-solid interface. The pale yellow is the right color to choose.



A. Normal CSDS color. Only λ_m is blocked by the central stop. The rest of the wavelengths pass through to reach the observer's eyes.
B. Distorted CSDS color. On top of the blocked λ_m, blue components are removed from the passing-through wavelengths due to the total reflection.
C. Distorted CSDS color. On top of the blocked λ_m, red components are removed from the passing-through wavelengths due to the total reflection.

This image explains the physics of how total reflection occurs.
By failing to consider the distortion of dispersion staining colors caused by total reflection, MAS used the wrong dispersion staining color and assigned incorrect RI values.

There is No Variability of Refractive Index within a Bundle



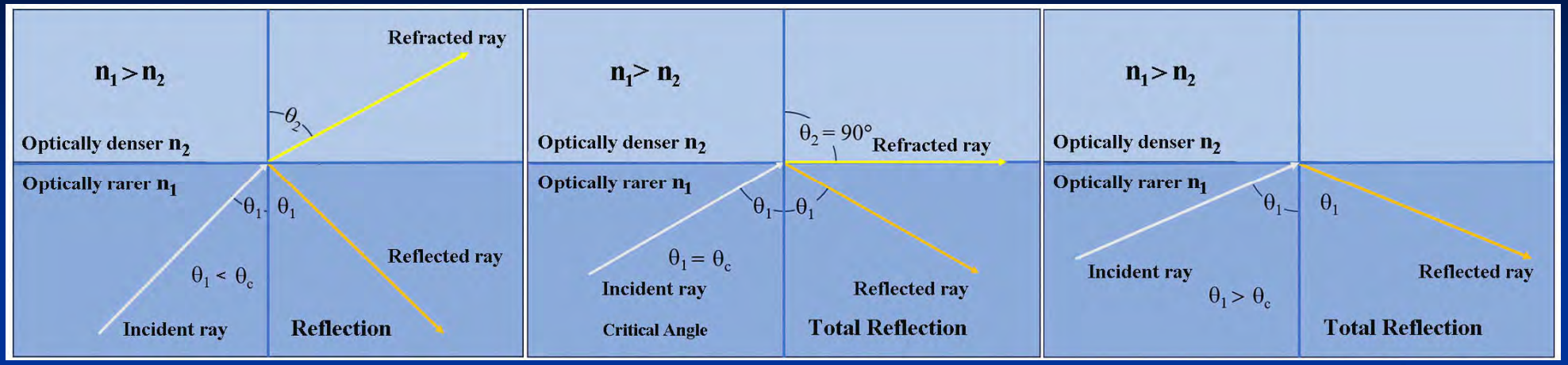
It is wrong for MAS to interpret the variation of dispersion staining color as the variation of refractive index within the bundle.

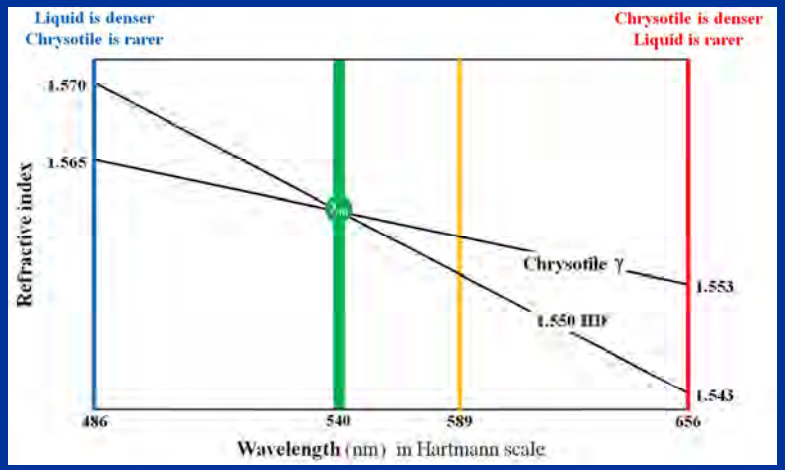
A mineral's RI is a constant governed by their chemical composition and crystal structure. MAS's theory that chrysotile's RI increases as the particle size decreases is unfounded and defies basic principles of physics. In fact, if such a theory is proved, it would shake the very foundation of physics.

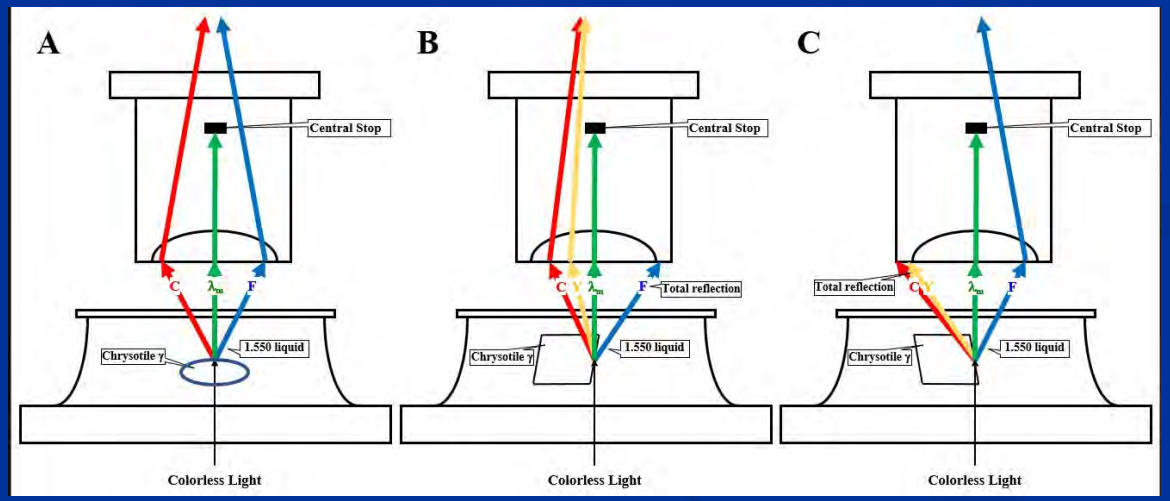
The variation of dispersion staining color is caused by the total reflection occurring at the liquid-solid interface

There is No Variability of Refractive Index within a Bundle

Understanding the formation of distorted dispersion staining color







λ	Color	γ	1.551 E	Critical Angle
486 nm	Blue	1.570	1.567	86.5°
656 nm	Red	1.553	1.543	83.5°

When light transmits from an optically denser (greater RI) to an optically rarer (smaller RI) medium, total internal reflection occurs at the critical angle.

The total reflection wavelengths are removed from the non-matching wavelength spectrum, resulting in the distorted dispersion staining color.

There is No Variability of Refractive Index within a Bundle

Table 1. Certified Values of Refractive Index for Chrysotile Asbestos in SRM 1866b

Wavelength (nm)	α Lower Limit[(a)]	α Fitted Value	α Upper Limit	γ Lower Limit	γ Fitted Value	γ Upper Limit
460	1.554	1.558	1.563	1.563	1.568	1.572
480	1.552	1.557	1.561	1.561	1.565	1.569
500	1.551	1.555	1.559	1.559	1.563	1.567
520	1.549	1.553	1.557	1.557	1.561	1.565
540	1.548	1.552	1.556	1.556	1.560	1.564
560	1.547	1.551	1.555	1.554	1.558	1.562
589.3	1.545	**1.549**	1.553	1.552	**1.556**	1.560
600	1.545	1.549	1.553	1.551	1.556	1.560
620	1.544	1.548	1.552	1.550	1.554	1.559
640	1.543	1.547	1.551	1.549	1.553	1.558

The certified refractive index values in the certificate issued by NIST for SRM 1866 apply to every fiber and fiber bundle in the standard reference material.

Refractive Index Does Not Change With the Particle Size

Table 1. Certified Values of Refractive Index for Chrysotile Asbestos in SRM 1866b

Wavelength (nm)	α Lower Limit[a]	α Fitted Value	α Upper Limit	γ Lower Limit	γ Fitted Value	γ Upper Limit
460	1.554	1.558	1.563	1.563	1.568	1.572
480	1.552	1.557	1.561	1.561	1.565	1.569
500	1.551	1.555	1.559	1.559	1.563	1.567
520	1.549	1.553	1.557	1.557	1.561	1.565
540	1.548	1.552	1.556	1.556	1.560	1.564
560	1.547	1.551	1.555	1.554	1.558	1.562
589.3	1.545	**1.549**	1.553	1.552	**1.556**	1.560
600	1.545	1.549	1.553	1.551	1.556	1.560
620	1.544	1.548	1.552	1.550	1.554	1.559
640	1.543	1.547	1.551	1.549	1.553	1.558

A mineral's RI is a constant governed by their chemical composition and crystal structure. MAS's theory that chrysotile's RI increases as the particle size decreases is unfounded and defies basic principles of physics. In fact, if such a theory is proved, it would shake the very foundation of physics.

The NIST SRM 1866 chrysotile RI values, α 1.549 and γ 1.556, were measured by John Phelps, a scientist at NIST, on a single fiber using the spindle stage technique. Dr. Longo's fibers cannot be any thinner than John Phelps's single chrysotile fiber. Dr. Longo's claim is not only unfounded but also without the support of credible measurement data.

Calidria Chrysotile RI Compared to 1866

SAMPLE 1

Sample 1 is a "pure", short range (short fiber) chrysotile from the New Idria serpentinite body of California. The sample is white, very homogeneous, and contains very short fibers/bundles (often < 20μm) of chrysotile. The asbestiform habit of the chrysotile (and the optical properties) are best observed by viewing at high magnification (400 - 500X). The mean refractive indices are 1.560 for γ and 1.555 for α. Chrysotile comprises >95% of the sample.

Of the 257 participating laboratories, eight did not report asbestos for this sample and one reported a different asbestos type. Ten laboratories reported one or both refractive indices outside the acceptance ranges for the chrysotile. Twenty-two laboratories reported an asbestos concentration outside the acceptance range.

The certified 1866 chrysotile RI values are α 1.549 and γ 1.556. The certified Calidria chrysotile RI values are α 1.555 and γ 1.560. Dr. Longo's RI values are another leap beyond the Calidria chrysotile RI values.

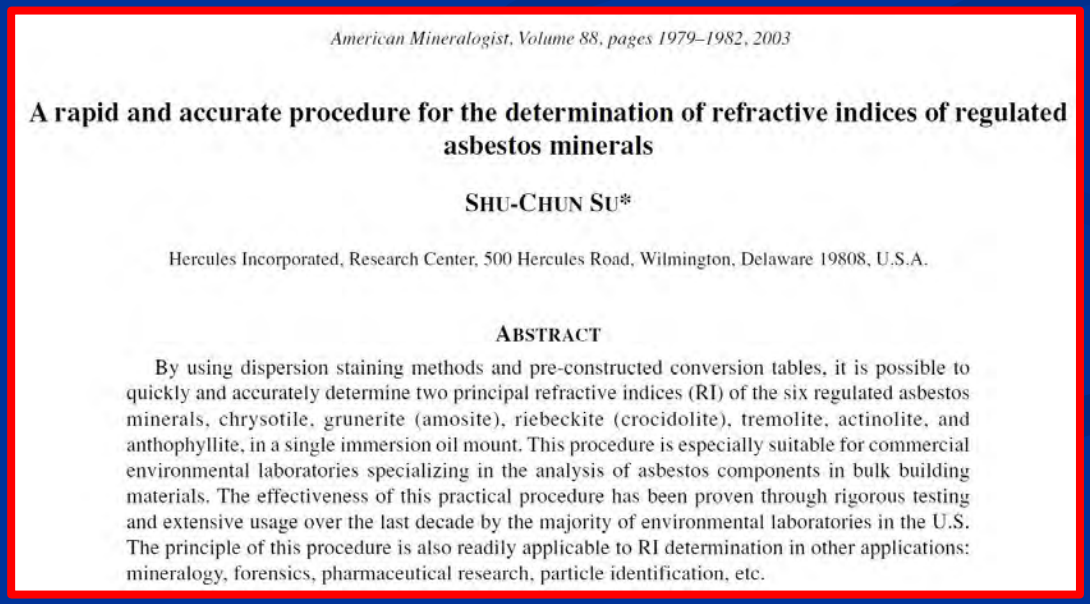
MAS Used My Procedure to Measure RI

Table 5

Comparison of Chrysotile Measured Refractive Indexes Between MAS, Dr. McCrone and Dr. Su

	Refractive Index Range Parallel	Refractive Index Range Perpendicular
MAS	ISO 1.568 to 1.561 CSM 1.568 to 1.564	ISO 1.558 to 1.550 CSM 1.556 to 1.550
Dr. McCrone	1.570 to 1.548	1.553 to 1.534
Dr. Su	1.580 to 1.540	1.579 to 1.541

MAS misinterpreted my table (Su, 2003)



American Mineralogist, Volume 88, pages 1979–1982, 2003

A rapid and accurate procedure for the determination of refractive indices of regulated asbestos minerals

SHU-CHUN SU*

Hercules Incorporated, Research Center, 500 Hercules Road, Wilmington, Delaware 19808, U.S.A.

ABSTRACT

By using dispersion staining methods and pre-constructed conversion tables, it is possible to quickly and accurately determine two principal refractive indices (RI) of the six regulated asbestos minerals, chrysotile, grunerite (amosite), riebeckite (crocidolite), tremolite, actinolite, and anthophyllite, in a single immersion oil mount. This procedure is especially suitable for commercial environmental laboratories specializing in the analysis of asbestos components in bulk building materials. The effectiveness of this practical procedure has been proven through rigorous testing and extensive usage over the last decade by the majority of environmental laboratories in the U.S. The principle of this procedure is also readily applicable to RI determination in other applications: mineralogy, forensics, pharmaceutical research, particle identification, etc.

MAS Misinterpreted My Table

TABLE 3. Conversion of the matching wavelength λ_o to the corresponding RI values

Mineral	Chrysotile	Amosite	Crocidolite	Tremolite			Actinolite or Anthophyllite		
Oil $n_D^{25°C}$	1.550	1.680	1.700	1.620	1.610	1.635	1.625	1.610	1.635
Oil Series	E	B	B	E	E	E	E	E	E
RI	n_α or n_γ	n_α or n_γ	n_α or n_γ	n_α or n_γ	n_α	n_γ	n_α or n_γ	n_α	n_γ
λ_o (nm)									
400									1.666
420									1.660
440									1.655
460									1.651
480									1.648
500									1.645
520									1.642
540									1.640
560									1.638
580									1.636
589									1.635
600									1.634
620	1.548	1.678	1.697	1.618	1.608	1.632	1.623	1.608	1.633
640	1.546	1.677	1.695	1.616	1.606	1.631	1.621	1.607	1.631
660	1.545	1.676	1.694	1.615	1.605	1.630	1.620	1.606	1.630
680	1.544	1.675	1.692	1.614	1.604	1.628	1.619	1.605	1.629
700									1.628
720									1.627
740									1.626
760									1.625
780									1.624
800									1.624
850									1.622
900									1.621
1000									1.618
Δ^1	0.(								0.0291
Δ^8	0.(								0.0127
$\Delta^1 - \Delta^8$	0.(								0.0164

Note: Temperature correction: If oil temperature is not 25 °C, for every 2 °C decrease (increase) in temperature, add (subtract) 0.001 to (from) the listed values.

The range of each asbestos's RI values in the table must be wider than its possible minimum and maximum RI values.

It doesn't mean the range represents the possible minimum and maximum RI values of chrysotile or other asbestos minerals.

Table 5

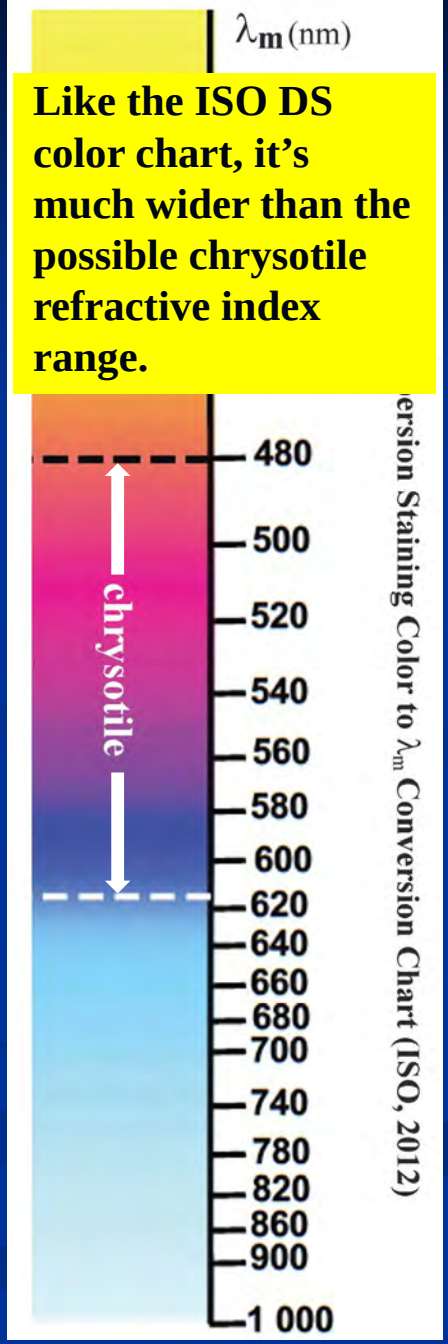
Comparison of Chrysotile Measured Refractive Indexes Between MAS, Dr. McCrone and Dr. Su

	Refractive Index Range Parallel	Refractive Index Range Perpendicular
MAS	ISO 1.568 to 1.561 CSM 1.568 to 1.564	ISO 1.558 to 1.550 CSM 1.556 to 1.550
Dr. McCrone	1.570 to 1.548	1.553 to 1.534
Dr. Su	1.580 to 1.540	1.579 to 1.541

MAS misinterpreted the ranges of my table are the possible minimum and maximum values of chrysotile's refractive indices.

The kindergarten stadiometer must be taller than the possible heights of children. It doesn't mean that kindergarten students can be six feet tall.

Like the ISO DS color chart, it's much wider than the possible chrysotile refractive index range.

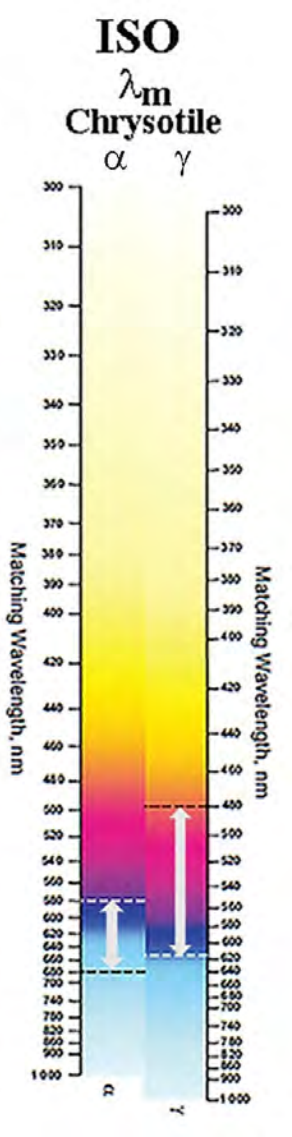


MAS Misinterpreted My Table

Chrysotile

in Cargille 1.560 (E)

λ_m	α							γ						
(nm)	17°C	19°C	21°C	23°C	25°C	27°C	29°C	17°C	19°C	21°C	23°C	25°C	27°C	29°C
300	1.652	1.651	1.650	1.649	1.648	1.647	1.646	1.645	1.644	1.643	1.642	1.641	1.641	1.640
320	1.632	1.631	1.630	1.629	1.628	1.628	1.627	1.627	1.626	1.625	1.624	1.623	1.622	1.621
340	1.618	1.617	1.616	1.615	1.614	1.613	1.613	1.614	1.613	1.612	1.611	1.610	1.609	1.608
360	1.607	1.606	1.606	1.605	1.604	1.603	1.602	1.604	1.603	1.602	1.601	1.600	1.599	1.599
380	1.599	1.598	1.597	1.596	1.595	1.595	1.594	1.596	1.595	1.595	1.594	1.593	1.592	1.591
400	1.593	1.592	1.591	1.590	1.589	1.588	1.587	1.590	1.589	1.588	1.588	1.587	1.586	1.585
420	1.587	1.586	1.585	1.584	1.583	1.583	1.582	1.585	1.584	1.583	1.583	1.582	1.581	1.580
440	1.583	1.582	1.581	1.580	1.579	1.578	1.577	1.581	1.580	1.579	1.578	1.577	1.577	1.576
460	1.579	1.578	1.577	1.576	1.575	1.574	1.573	1.578	1.577	1.576	1.575	1.574	1.573	1.572
480	1.576	1.575	1.574	1.573	1.572	1.571	1.570	1.575	1.574	1.573	1.572	1.571	1.570	1.569
500	1.573	1.572	1.571	1.570	1.569	1.568	1.567	1.572	1.571	1.570	1.569	1.568	1.567	1.567
520	1.570	1.569	1.568	1.567	1.567	1.566	1.565	1.570	1.569	1.568	1.567	1.566	1.565	1.564
540	1.568	1.567	1.566	1.565	1.564	1.563	1.563	1.568	1.567	1.566	1.565	1.564	1.563	1.562
560	1.566	1.565	1.564	1.563	1.562	1.562	1.561	1.566	1.565	1.564	1.563	1.562	1.561	1.560
580	1.564	1.563	1.563	1.562	1.561	1.560	1.559	1.564	1.563	1.562	1.562	1.561	1.560	1.559
600	1.563	1.562	1.561	1.560	1.559	1.558	1.557	1.563	1.562	1.561	1.560	1.559	1.558	1.557
620	1.561	1.560	1.560	1.559	1.558	1.557	1.556	1.562	1.561	1.560	1.559	1.558	1.557	1.556
640	1.560	1.559	1.558	1.557	1.556	1.556	1.555	1.560	1.559	1.559	1.558	1.557	1.556	1.555
660	1.559	1.558	1.557	1.556	1.555	1.554	1.553	1.559	1.558	1.557	1.557	1.556	1.555	1.554
680	1.558	1.557	1.556	1.555	1.554	1.553	1.552	1.558	1.557	1.556	1.556	1.555	1.554	1.553
700	1.557	1.556	1.555	1.554	1.553	1.552	1.551	1.557	1.556	1.556	1.555	1.554	1.553	1.552
720	1.556	1.555	1.554	1.553	1.552	1.551	1.550	1.557	1.556	1.555	1.554	1.553	1.552	1.551
740	1.555	1.554	1.553	1.552	1.551	1.551	1.550	1.556	1.555	1.554	1.553	1.552	1.551	1.550
760	1.554	1.553	1.552	1.552	1.551	1.550	1.549	1.555	1.554	1.553	1.552	1.551	1.550	1.550
780	1.554	1.553	1.552	1.551	1.550	1.549	1.548	1.554	1.553	1.553	1.552	1.551	1.550	1.549
800	1.553	1.552	1.551	1.550	1.549	1.548	1.547	1.554	1.553	1.552	1.551	1.550	1.549	1.548
850	1.551	1.550	1.550	1.549	1.548	1.547	1.546	1.552	1.551	1.550	1.550	1.549	1.548	1.547
900	1.550	1.549	1.548	1.547	1.546	1.546	1.545	1.551	1.550	1.549	1.548	1.547	1.547	1.546
950	1.549	1.548	1.547	1.546	1.545	1.544	1.543	1.550	1.549	1.548	1.547	1.546	1.546	1.545
1000	1.548	1.547	1.546	1.545	1.544	1.543	1.542	1.549	1.548	1.547	1.546	1.546	1.545	1.544



Although the possible RI ranges of chrysotile α & γ are only a small section (between the dotted lines) of the CSDS color chart, the chart must cover the whole λ_m spectrum from 300 to 1000 nm. So does my conversion table. The ranges of the ISO chart and my table must be much wider than the RI range (between the dotted lines) of chrysotile. For people who understand the principle, my table is the numerical version of the ISO graphic chart.

Dr. Longo Misunderstood the RI Liquid's Effect on Mineral's RI

THE MICROSCOPE • Vol. 69:2, pp 51–69, 2022

The Dispersion Staining Technique and Its Application to Measuring Refractive Indices of Non-opaque Materials, with Emphasis on Asbestos Analysis

Shu-Chun Su, Ph.D.
Technical Expert, National Voluntary Laboratory Accreditation Program
National Institute of Standards and Technology[1]

3. *Select a proper RI liquid to mount the sample.*

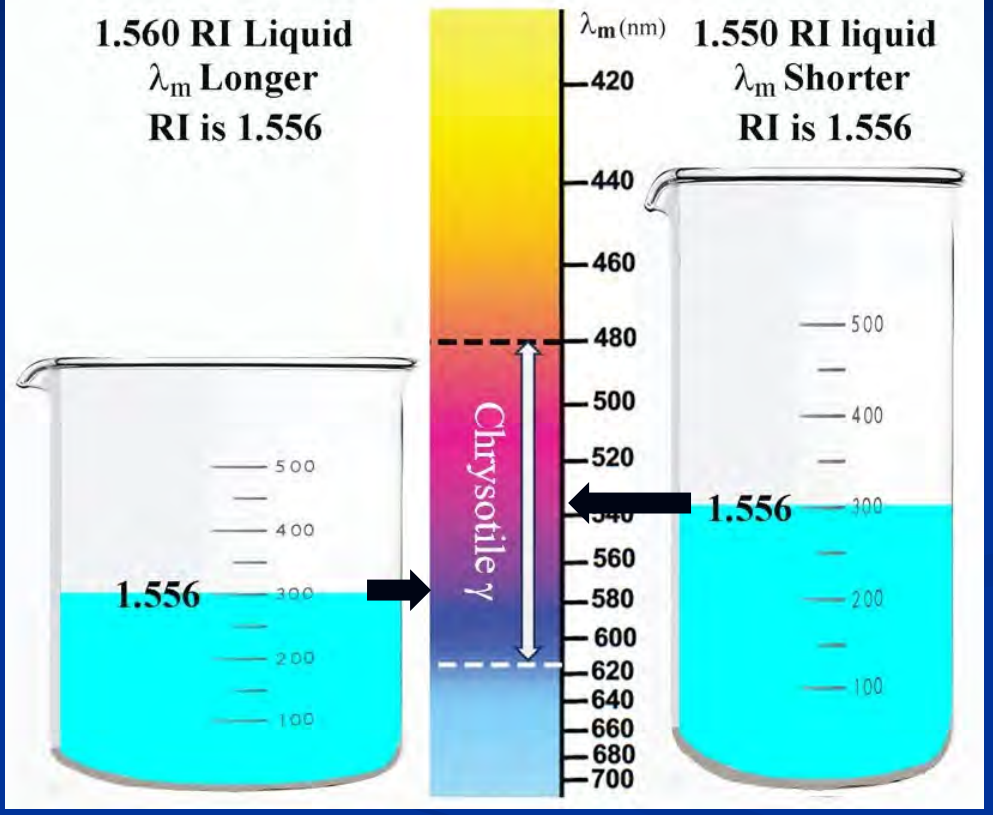
Mount the suspected asbestos fibers in an appropriate RI liquid according to Table 4 DRIMMC liquid [13] or 5 Cargille liquid [14], which lists two cases: (1) for regulatory, legal, forensic, etc., which requires higher accuracy, and (2) for routine commercial analysis with less stringent accuracy requirements. For high accuracy measurement such as regulatory, legal and forensic analysis, etc., the rule of thumb is to choose RI liquids as close as possible to the RI's to be measured. For example, there are chrysotile minerals whose RIs are significantly higher than those of the standard chrysotile from the NIST SRM 1866 set. In that case, 1.555 or 1.560, instead of 1.550, RI liquids should be used to determine γ (Table 4). When efficiency is a priority and the accuracy requirement is less stringent, choose an RI liquid higher than α and lower than γ so that the two RI's can be determined in a single preparation.

In 2022, I published a paper on the application of the dispersion staining technique to asbestos analysis. I recommended the use of 1.560 RI liquid for measuring the γ of Calidria chrysotile to improve the accuracy of measurement.

The only purpose of switching from 1.550 to 1.560 is to improve the accuracy of RI measurement because chrysotile's RI is a constant and does change with the surrounding liquid medium.

The right diagram shows two beakers, the left one is fatter, representing 1.560 liquid, and the right one is thinner, representing 1.550 liquid. The volume of water represents the γ refractive index.

When the same mineral is measured in two different RI liquids, its RI remains the same, but the matching wavelength λm changes accordingly: the lower liquid produces a shorter λm and the higher liquid produces a longer λm.



The right diagram shows two beakers, the left one is fatter, representing 1.560 liquid, and the right one is thinner, representing 1.550 liquid. The volume of water represents the γ refractive index. The 300 milliliters of water volume – γ value – didn't change, but the water level – λ_m – did from a shorter (upper) matching wavelength to a longer (lower) matching wavelength.

Dr. Longo Misunderstood the RI Liquid's Effect on Minerals' RI

M71614-M71643-M71740 J&J Baby Powders

Date	MAS No.			γ		α	
				Low	High	Low	High
2023-02-28	M71614	001	1	1.564	1.564	1.561	1.561
			2	1.565	1.565	1.561	1.561
			3	1.568	1.568	1.557	1.560
			4	1.565	1.568	1.560	1.564
2023-10-19	M71643	001	1	1.566	1.566	1.561	1.561
			2	1.566	1.569	1.557	1.561
			3	1.561	1.561	1.552	1.552
			4	1.568	1.568	1.559	1.559
2024-02-15	M71740	001	1	1.564	1.564	1.560	1.560
			2	1.564	1.564	1.560	1.560
			3	1.565	1.565	1.562	1.562
			4	1.563	1.563	1.561	1.561
			Average	1.565	1.565	1.559	1.560
			Grand Average	1.565		1.560	

Three Types of Chrysotile

Type	α	γ	Birefringence	RI	Source
SRM 1866	1.549	1.556	0.007	Standard	NIST
Calidria	1.555	1.560	0.005	Significantly higher than 1866	NVLAP
New?	1.560*	1.565*	0.005	Significantly higher than Calidria	MAS

* Average of 12 samples in M71614, M71643, and M71740.

In 2022, Dr. Longo switched to 1.560 RI liquid. Without any background in optical crystallography, Dr. Longo mistakenly thought measuring in the 1.560 liquid would increase the fiber's refractive index.

Instead of improving the accuracy of RI measurement, the 1.560 liquid produced a suite of augmented α and γ values.

The left table summarizes 12 pairs of α and γ values from M71614, M71643, and M71740.

Were those data credible (they were not), MAS single-handedly discovered a new type of chrysotile, whose refractive index is significantly higher than the Calidria chrysotile as shown in the left table.

Obviously, there has never been any report of the existence of such a unique type of chrysotile with such peculiar optical properties.

Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

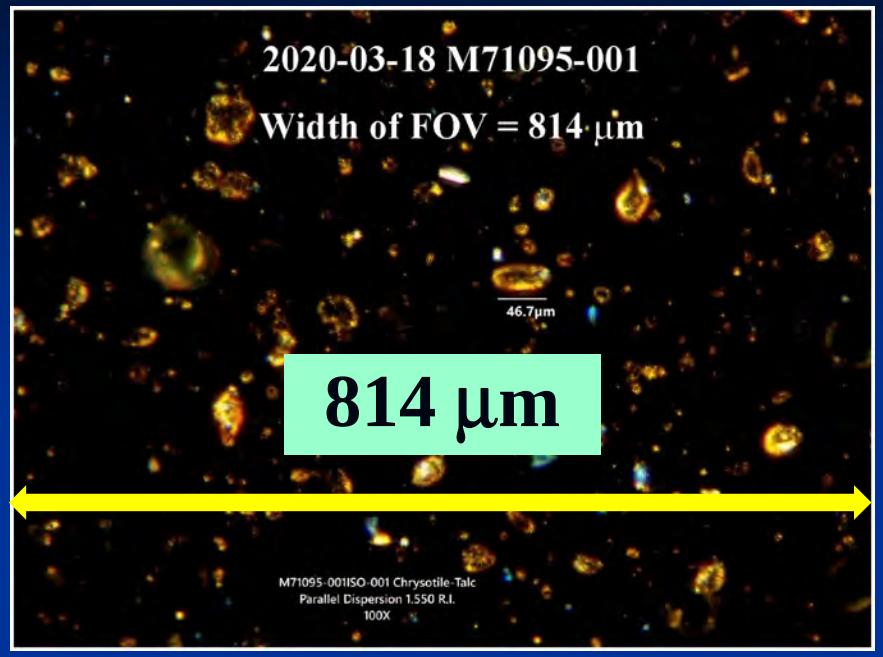
Incorrect Scale Bars

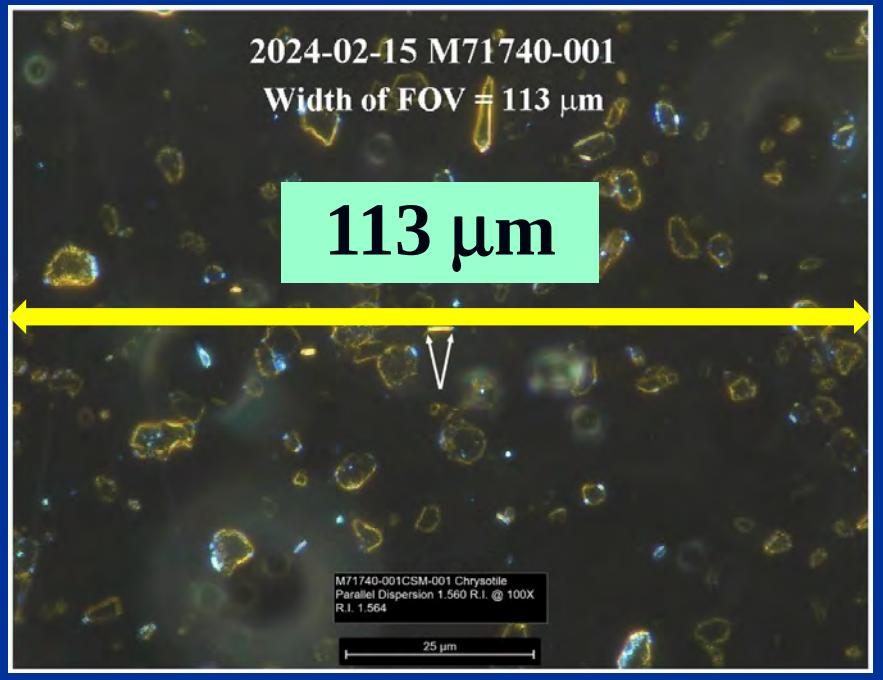
MAS's Inability to Create Scale Bars

Date	MAS No.	Chrysotile Length (µm)		
		Individual	Average	vs. Talc
2020-02-24 M70484	001-001	78.8	61.6	Same partcle size range as talc
	001-002	33.3		
	001-003	38.5		
	001-004	71.3		
	001-005	62.2		
	001-006	57.0		
	001-007	70.4		
	001-008	49.6		
	002-001	58.5		
	002-002	78.5		
	002-003	79.3		
2020-03-18 M71095	001-001	46.7	32.2	Same partcle size range as talc
	001-002	13.3		
	001-003	34.8		
	001-004	34.1		
2020-03-20 M70877	001-001	60.0	37.6	Same partcle size range as talc
	001-002	25.9		
	001-003	23.0		
	001-004	41.5		
2021-05-25 M71228	001-001	105.2	55.2	Same partcle size range as talc
	001-002	59.5		
	001-003	17.2		
	001-004	38.8		
2022-03-11 M71262	001-001	32.8	32.8	Same partcle size range as talc
	001-002	21.6		
	001-003	26.7		
	001-004	50.0		
2023-03-28 M71614	001-001	6.0	4.9	Same partcle size range as talc
	001-002	5.1		
	001-003	3.9		
	001-004	4.8		
2023-10-19 M71643	001-001	3.9	3.8	Same partcle size range as talc
	001-002	6.6		
	001-003	2.2		
	001-004	2.7		
2024-02-15 M71740	001-001	3.6	8.5	Same partcle size range as talc
	001-002	9.4		
	001-003	12.0		
	001-004	8.9		

Drastic variation of "chrysotile" particle size demonstrates continued inaccuracies in measuring particle sizes.

MAS's Inability to Create Scale Bars





The width of the field of view (FOV) can be calculated from the scale bar length or the width of an object.

Back on 2020-03-18, the 814 µm FOV width was wrong.

Five years later, the mistake remained uncorrected. 2024-02-15 still reported a grossly wrong FOV width of 113 µm.

Regardless of the microscope's make, Olympus Nikon Leitz or Leica, the FOV width for a 10X objective lens is slightly over 1 mm or 1,000 µm.

The only conclusion is that MAS is NOT capable of correctly performing the most fundamental operation procedure of PLM.

What is important is that talc particle sizes in these two micrographs are the same.

Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

Incorrect Particle Size Analysis Results

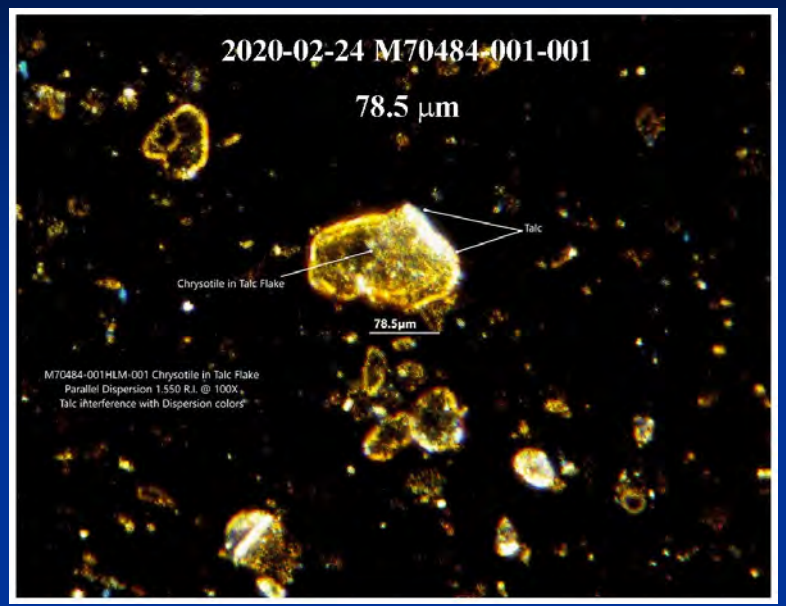
MAS's Particle Size Analysis Data

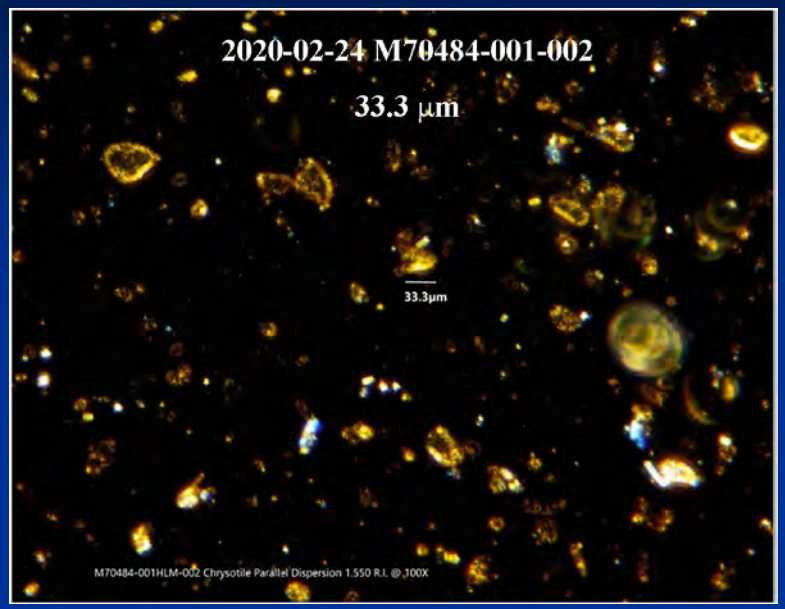
Mineral	Minimum (μm)	Average (μm)	Maximum (μm)	Reference
Talc	1.5	9.3	37.0	MAS (2017)
SG-210 Chrysotile	3.0	8.0	10.0	MAS (2023)

- **MAS's particle size measurements in various reports do not conform to the above data.**
- **MAS's data do not conform to the material evidence of USP (2022) and Pier (2017)**
- **The maximum length of SG-210 measured by me is hundreds of micrometers, much longer than 10 micrometers by MAS.**

Incorrect Particle Size Measurement Results

2020-02-24 MAS Rpt JBP-Zimmerman



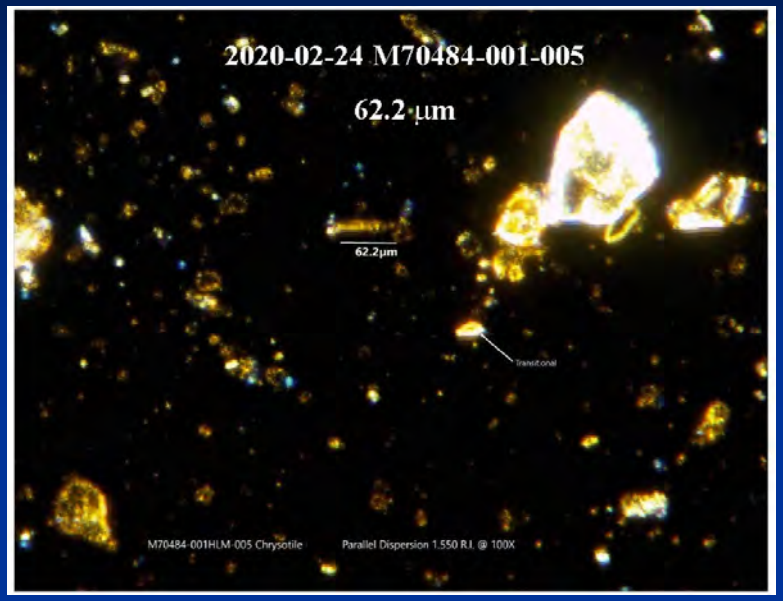


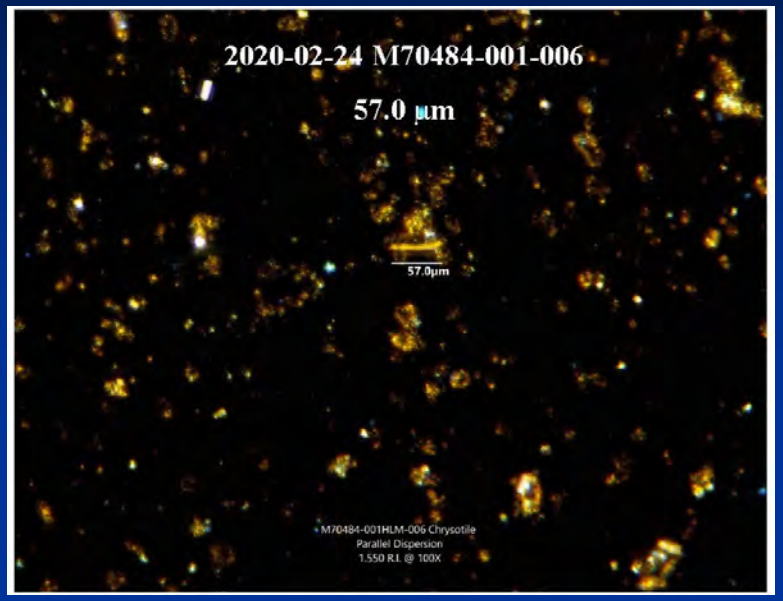
All four chrysotile particles were measured and labeled by MAS.

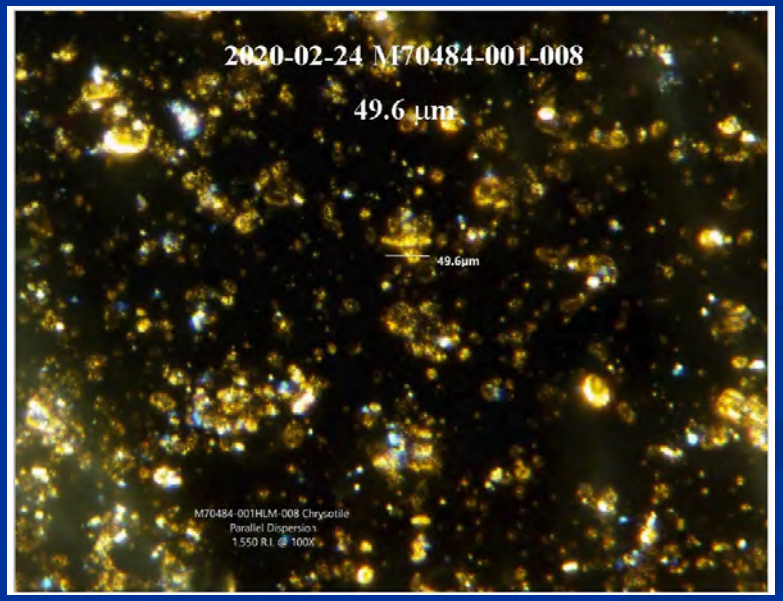
All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Incorrect Particle Size Measurement Results

2020-02-24 MAS Rpt JBP-Zimmerman





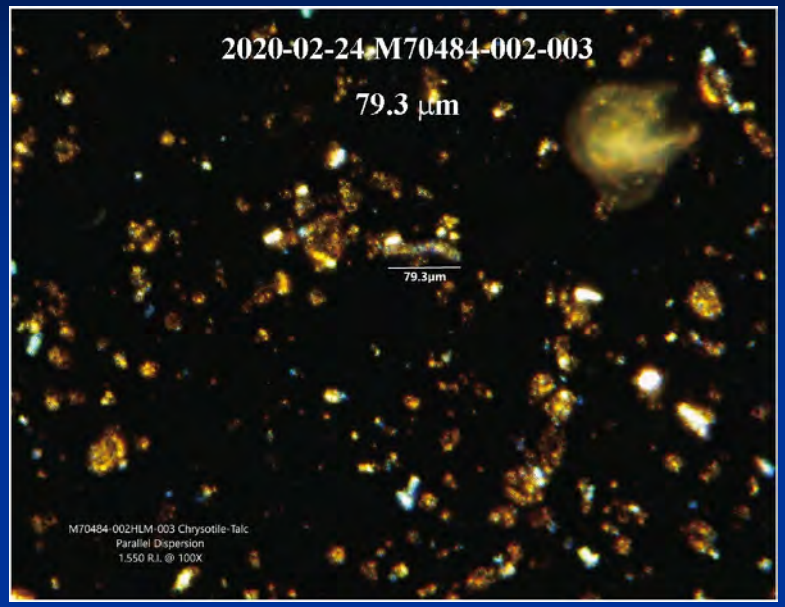


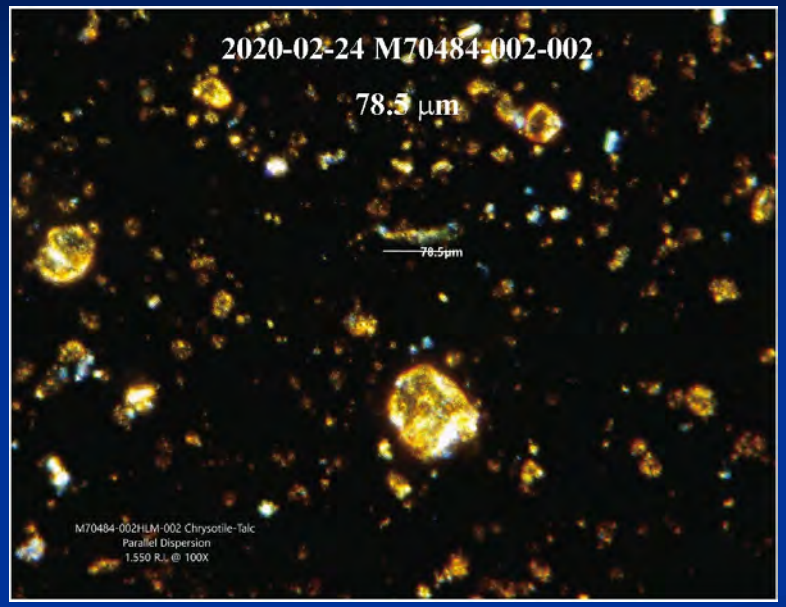
All four chrysotile particles were measured and labeled by MAS.

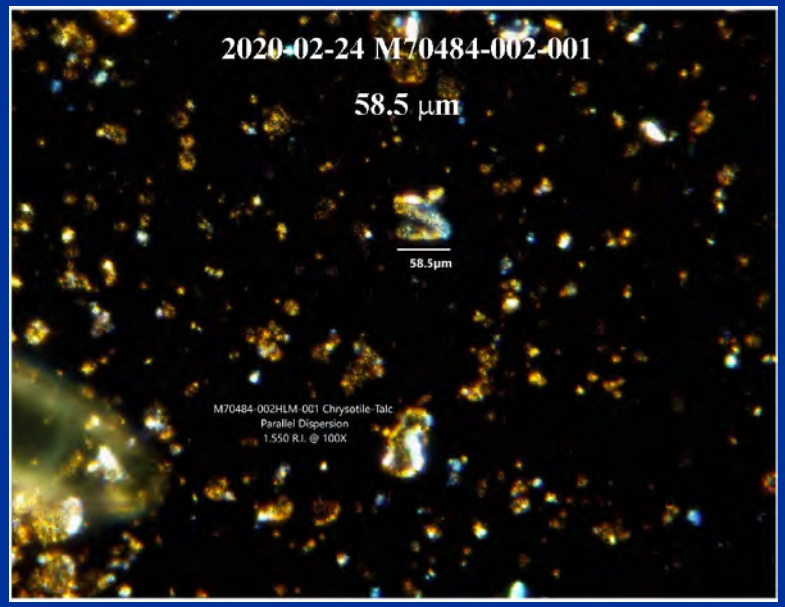
All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Incorrect Particle Size Measurement Results

2020-02-24 MAS Rpt JBP-Zimmerman





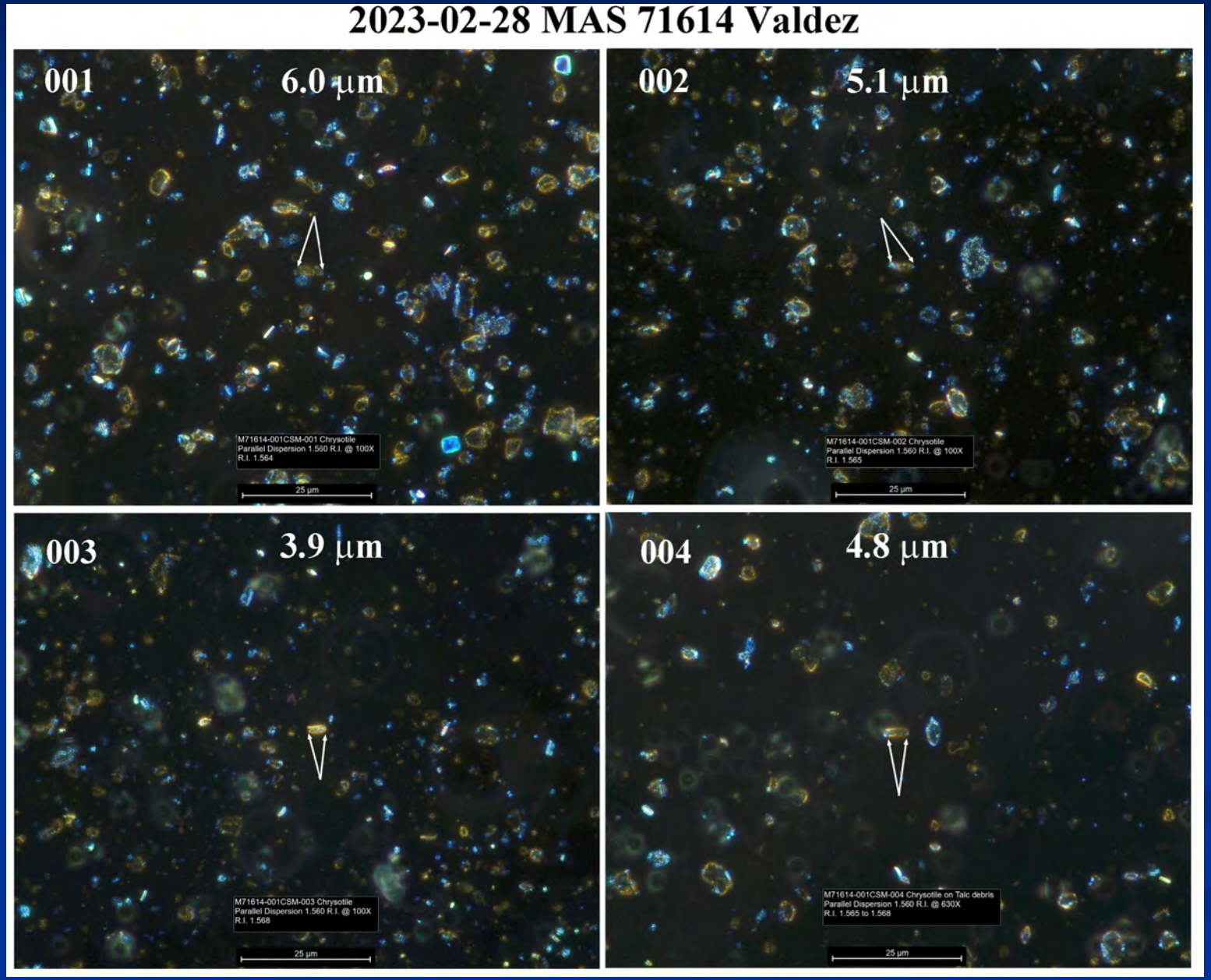


All three chrysotile particles were measured and labeled by MAS.

All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Incorrect Particle Size Measurement Results

2023-02-28 M71614 Valadez Bottle Report

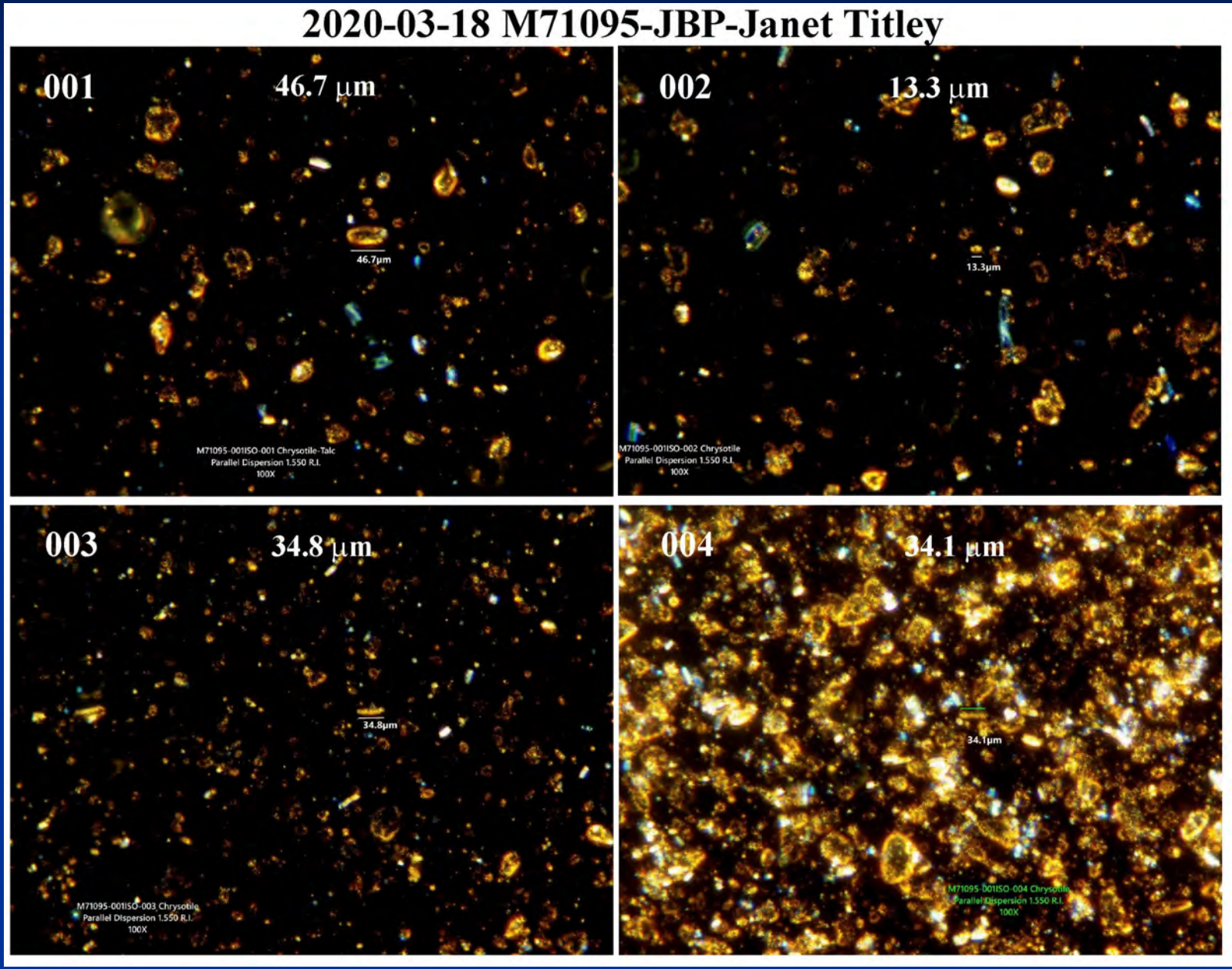


All four chrysotile particles are under 5 micrometers according to the scale bars.

All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Incorrect Particle Size Measurement Results

2020-03-18 M71095 Rpt JBP-Titley

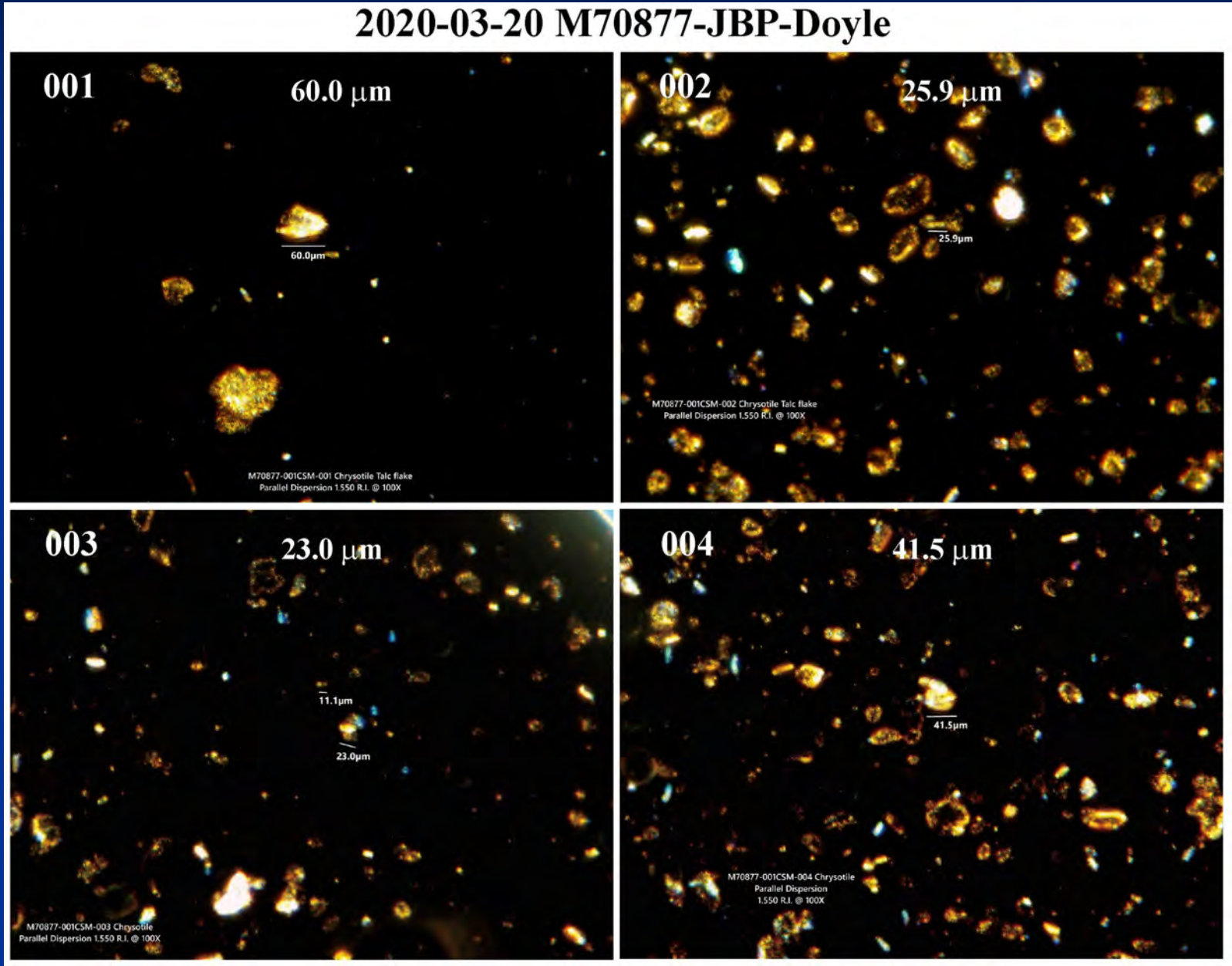


The talc and chrysotile particle sizes of all four samples are much greater than MAS's own data from their SEM analysis.

All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Incorrect Particle Size Measurement Results

2020-03-20 M70877 Rpt JBP-Doyle

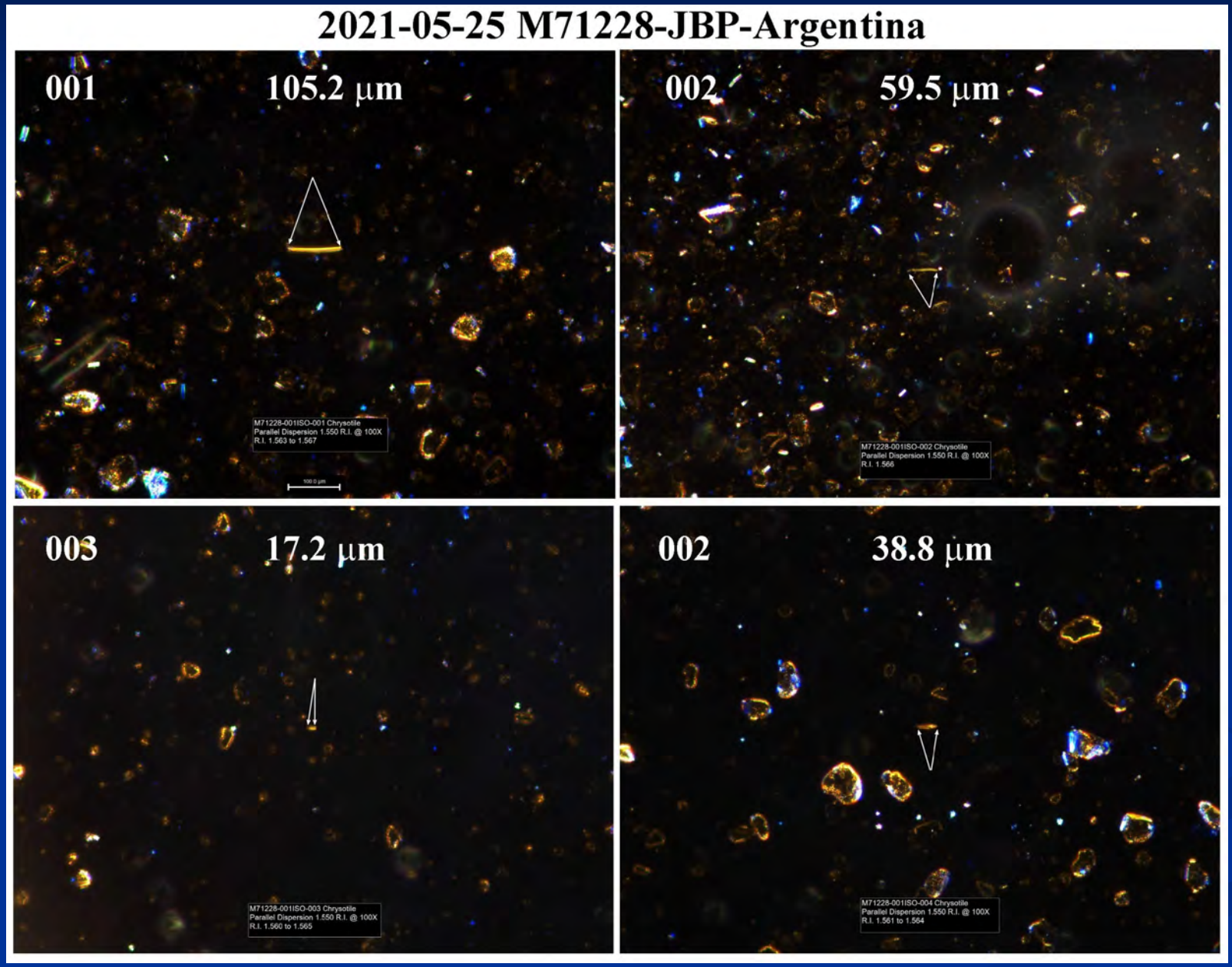


The talc and chrysotile particle sizes of all four samples are much greater than MAS's own data from their SEM analysis.

All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Incorrect Particle Size Measurement Results

2021-05-25 M71228 OTShelf JBP Purchased Argentina

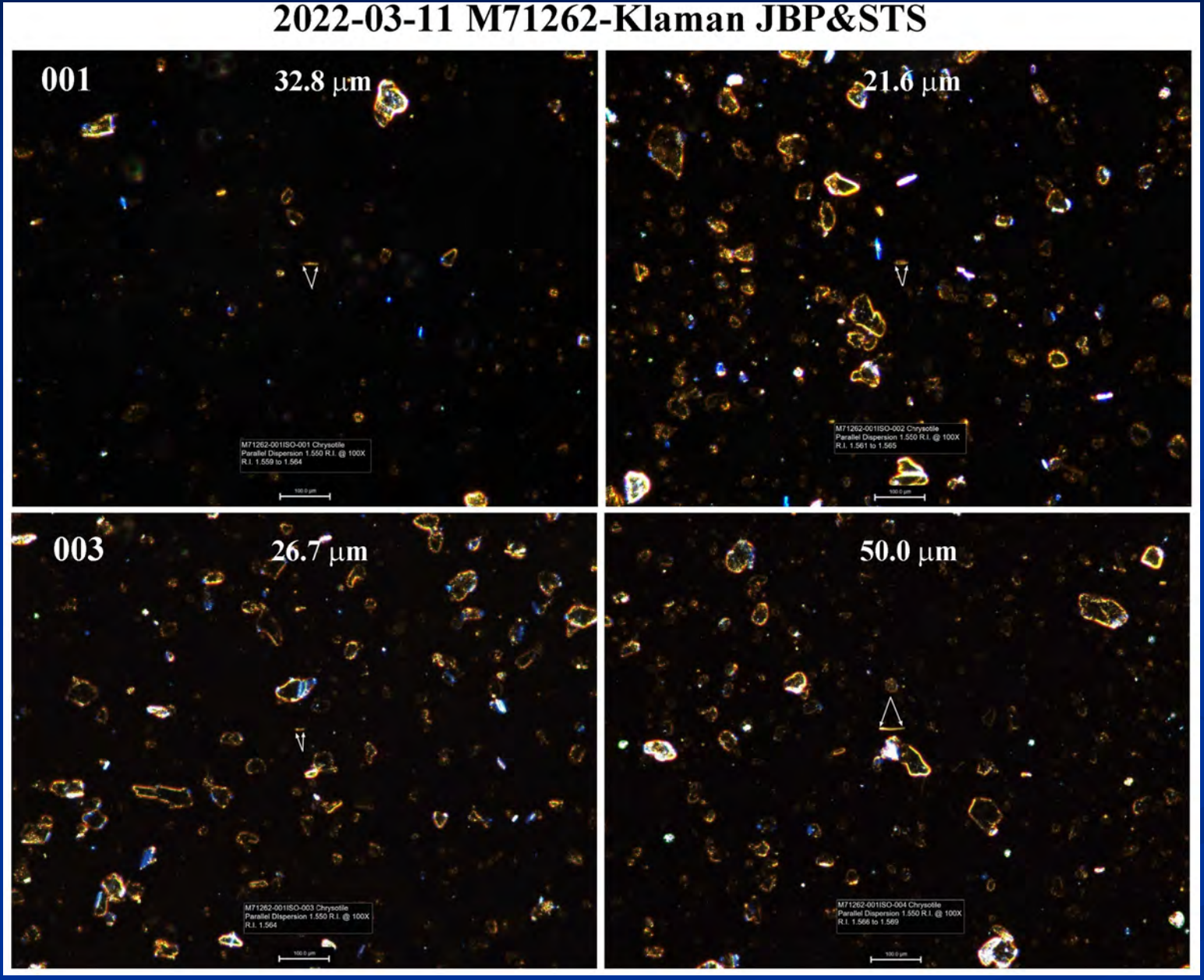


The talc and chrysotile particle sizes of all four samples are much greater than MAS's own data from their SEM analysis.

All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Incorrect Particle Size Measurement Results

2022-03-11 M71262 Analy of Klayman's JBP & STS Containers

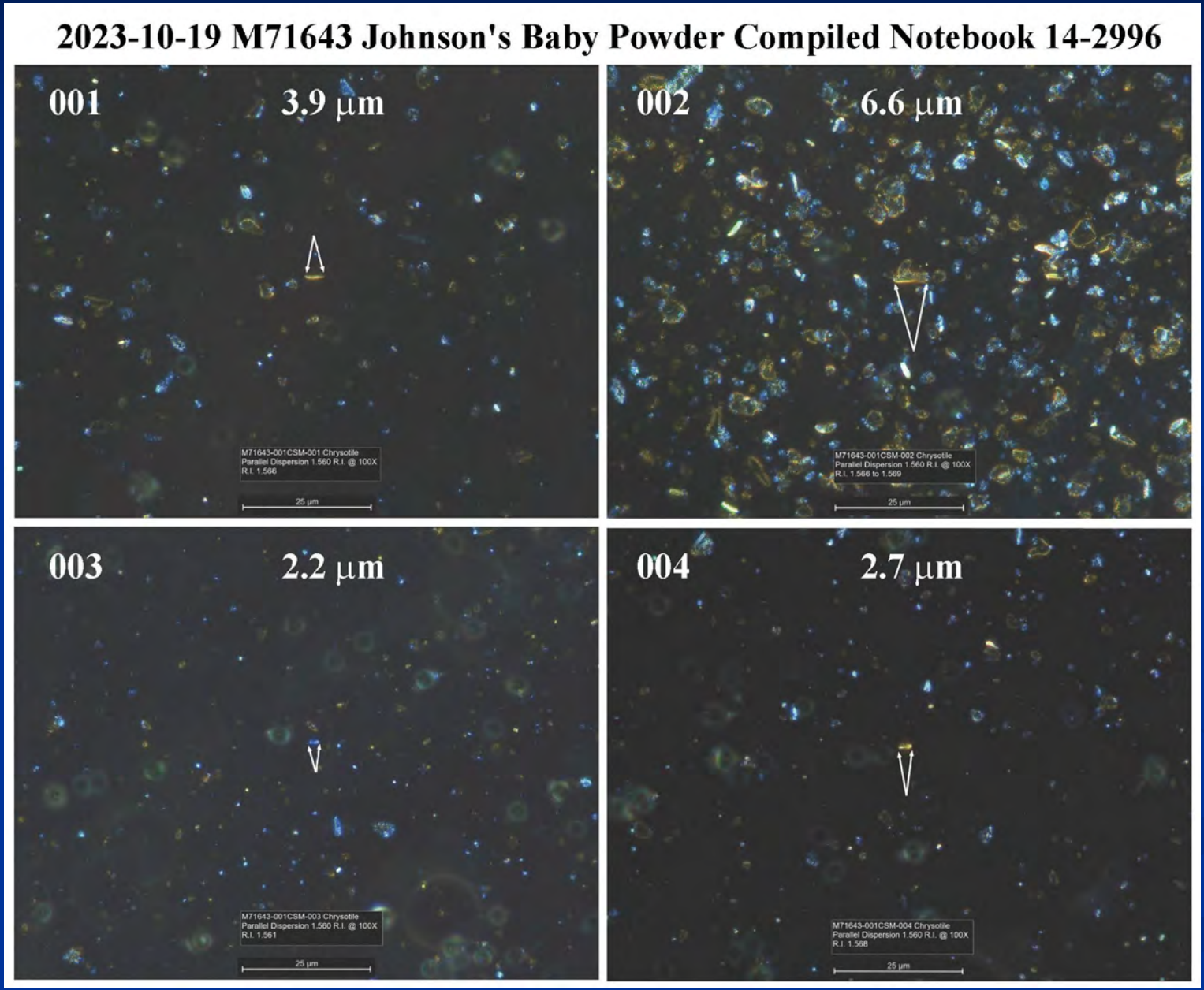


The talc and chrysotile particle sizes of all four samples are much greater than MAS's own data from their SEM analysis.

All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Incorrect Particle Size Measurement Results

2023-10-19 M71643 Johnson's Baby Powder Compiled Notebook 14-2996

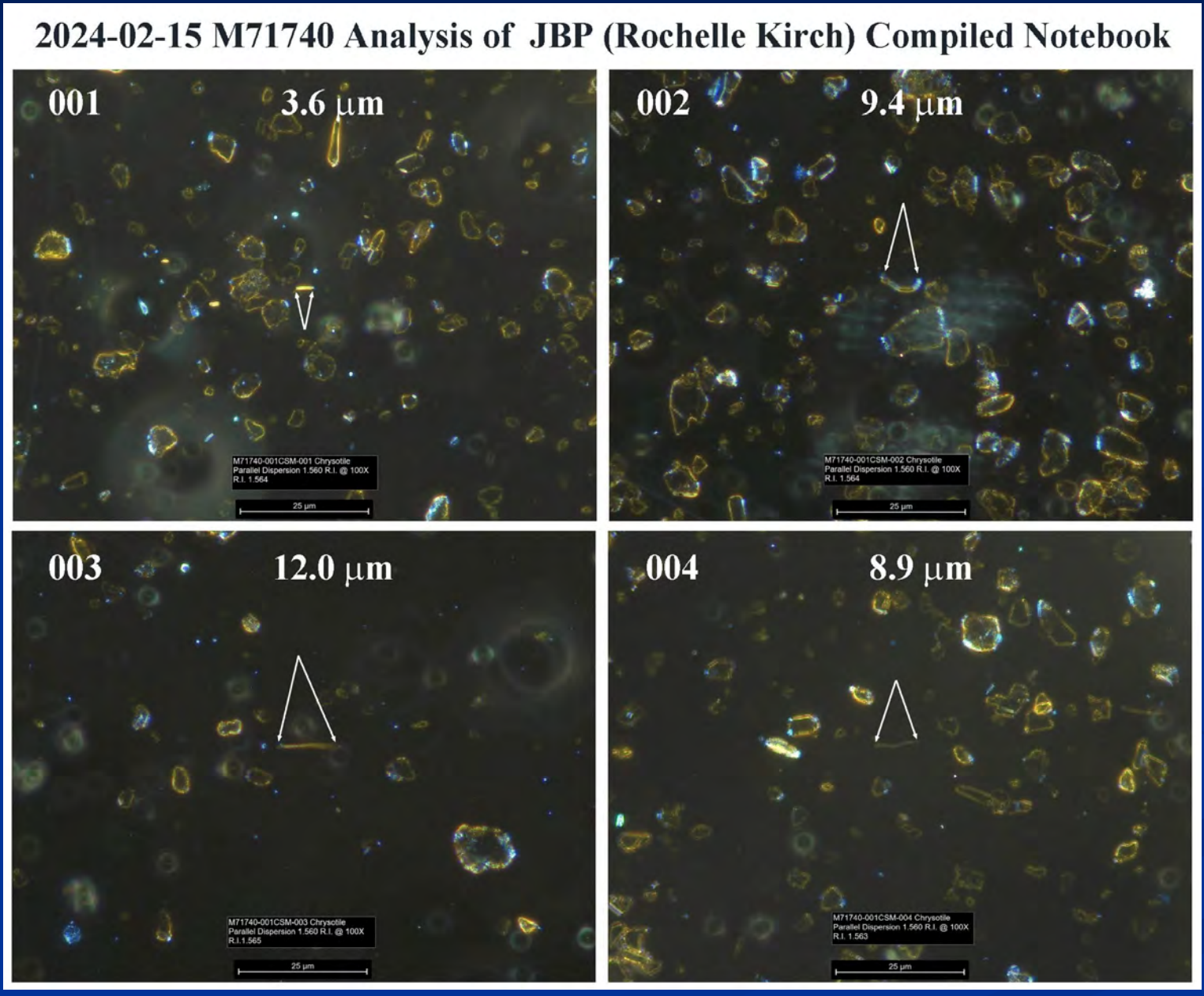


All four chrysotile particles are under 5 micrometers according to the scale bars.

All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Incorrect Particle Size Measurement Results

2024-02-15 M71740 Analysis of JBP (Rochelle Kirch) Compiled Notebook



The particle sizes of four chrysotile particles do not conform to MAS's SG-210 Calidria data (2023).

All four chrysotile particles are similar to the particle sizes of the matrix talc particles.

Summary of Eight Particle Size Measurement Results

Date	MAS No.	Chrysotile Length (μm)		
		Individual	Average	vs. Talc
2020-02-24 M70484	001-001	78.8	61.6	Same partcle size range as talc
	001-002	33.3		
	001-003	38.5		
	001-004	71.3		
	001-005	62.2		
	001-006	57.0		
	001-007	70.4		
	001-008	49.6		
	002-001	58.5		
	002-002	78.5		
	002-003	79.3		
2020-03-18 M71095	001-001	46.7	32.2	Same partcle size range as talc
	001-002	13.3		
	001-003	34.8		
	001-004	34.1		
2020-03-20 M70877	001-001	60.0	37.6	Same partcle size range as talc
	001-002	25.9		
	001-003	23.0		
	001-004	41.5		
2021-05-25 M71228	001-001	105.2	55.2	Same partcle size range as talc
	001-002	59.5		
	001-003	17.2		
	001-004	38.8		
2022-03-11 M71262	001-001	32.8	32.8	Same partcle size range as talc
	001-002	21.6		
	001-003	26.7		
	001-004	50.0		
2023-03-28 M71614	001-001	6.0	4.9	Same partcle size range as talc
	001-002	5.1		
	001-003	3.9		
	001-004	4.8		
2023-10-19 M71643	001-001	3.9	3.8	Same partcle size range as talc
	001-002	6.6		
	001-003	2.2		
	001-004	2.7		
2024-02-15 M71740	001-001	3.6	8.5	Same partcle size range as talc
	001-002	9.4		
	001-003	12.0		
	001-004	8.9		

Mineral	Minimum (μm)	Average (μm)	Maximum (μm)	Reference
Talc	1.5	9.3	37.0	MAS (2017)
SG-210 Chrysotile	3.0	8.0	10.0	MAS (2023)

The chrysotile particle sizes of the first three samples were measured and labeled by MAS.

The chrysotile particle sizes of the other five samples were measured in reference to MAS's scale bars.

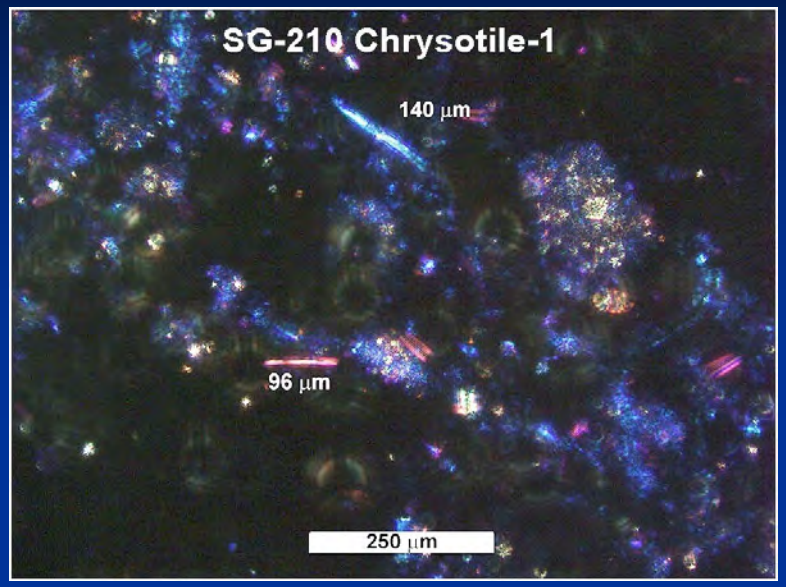
None of them conforms to MAS's data in the above table.

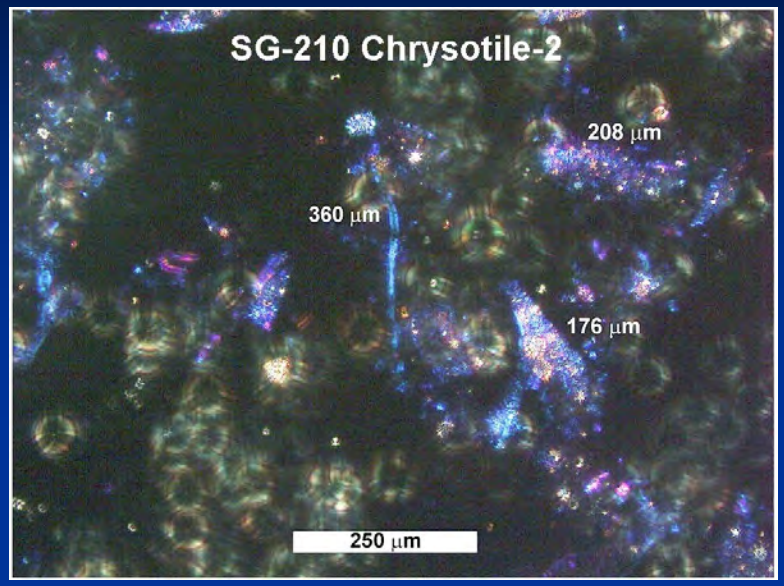
The particle size range of every chrysotile particle is the same as the matrix talc particles.

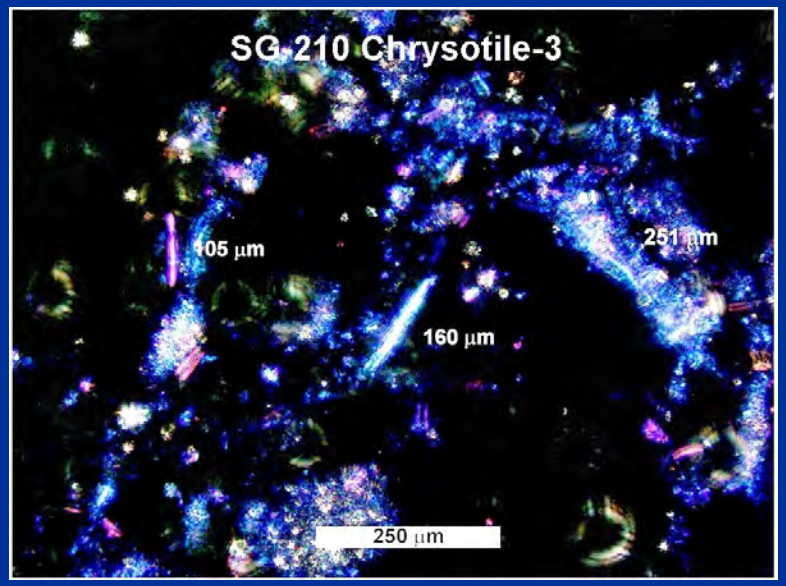
There is a great degree of inconsistency in "chrysotile" particle sizes reported by MAS over the last five years.

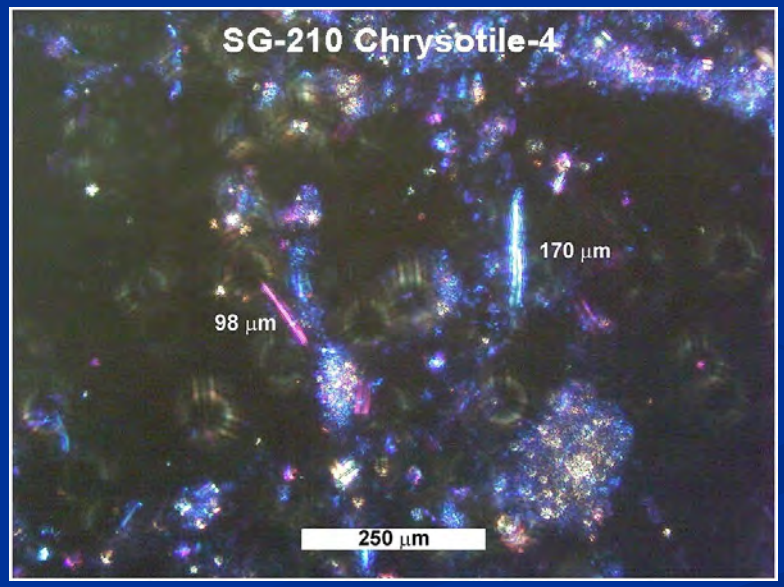
The only conclusion is that MAS is NOT capable of fixing this systematic error because MAS lacks the ability to perform the most fundamental particle size measuring procedure by PLM.

MAS Misidentified Talc as Chrysotile
Evidence # 2 – Particle Size









These four images show that Calidria chrysotile structure lengths could be hundreds of micrometers much longer than the 37 micrometers of the SG-210 maximum length reported by MAS.

Tensile Strength of Chrysotile

Structural features of natural and acids modified chrysotile nanotubes

Myroslav Sprynskyy [a], Janusz Niedojadło [b], Bogusław Buszewski [a]

ELSEVIER Chemistry of Solids
Volume 72, Issue 9, September 2011, Pages 1015-1026

Structural features of natural and acids modified chrysotile nanotubes

They are stronger than steel, highly tolerant of corrosion and much cheaper than synthetic fibers. The measured tensile strength of chrysotile fibers has been reported in the range 1.1–4.4 GPa [29].

1.1 to 4.4 GPa or 159,000 – 638,000 Psi

Sprynskyy, M. et. al. (2011) Structural features of natural and acids modified chrysotile nanotubes. Journal of Physics and Chemistry of Solids. Volume 72, Issue 9. Pages 1015-1026. https://doi.org/10.1016/j.jpcs.2011.05.013.

They are stronger than steel, highly tolerant of corrosion and much cheaper than synthetic fibers. The measured tensile strength of chrysotile fibers has been reported in the range 1.1-4.4 Gpa.
Conclusions: The raw chrysotile is presented by bundles of fibers about 50–10 micrometers in size, which are able to splitting with generation of thinner bundles up to one micrometer. The outer diameters of individual nanotubes vary from 15 to 30 nm, while the inner diameters range from 2 to 6 nm. The single chrysolite fibers are presented by cylindrical nanotubes of various forms: rectilinear cylinders (the most widespread), cylinders with cup-like ends, cylinder-in-cylinder and cone-in-cone tubes.

Tensile Strength of Talc

2.33 MPa or 338 Psi

Syed, S.F., Chen, J.C. & Guo, G. (2020) Optimization of Tensile Strength and Shrinkage of Talc-Filled Polypropylene as a Packaging Material in Injection Molding. J Package Technol Res 4, 69–78. https://doi.org/10.1007/s41783-019-00077-6

Tensile Strength of Hemp Fibers

Fiber	Tensile strength (MPa)	Young's modulus (GPa)	Density (g cm^{-3})	Refs
Cotton	330–585	4.5–12.6	1.5–1.54	119
Flax	345–1035	27.6–45.0	1.43–1.52	119
Hemp	690–1000	50.0	1.47–1.50	119
Jute	393–800	13–26.5	1.3–1.45	82
Silk	650–750	16	1.3–1.38	82
Kenaf	930	53.0	1.5	119
Ramie	400–1000	61.5	1.5–1.6	119
Sisal	511–635	9.4–15.8	1.16–1.5	119
Banana	500–700	7–20	1.4	120
Softwood	100–170	10–50	1.4	120
Hardwood	90–180	10–70	1.4	120
E-glass	1800	69.0–73.0	2.5	119
HM carbon	2400	380	1.95	121,122
HS carbon	3400	230	1.75	121,122
Kevlar 49	3000	130	1.45	121,122

HM: high modulus, HS: high strength.

690 – 1,000 MPa or 100,050 – 145,000 Psi

Shubhra, T.H. et. al., (2011). Mechanical properties of polypropylene composites: a review. J Thermoplast Compos. 26. 362-391. https://doi.org/10.1177/0892705711428659.

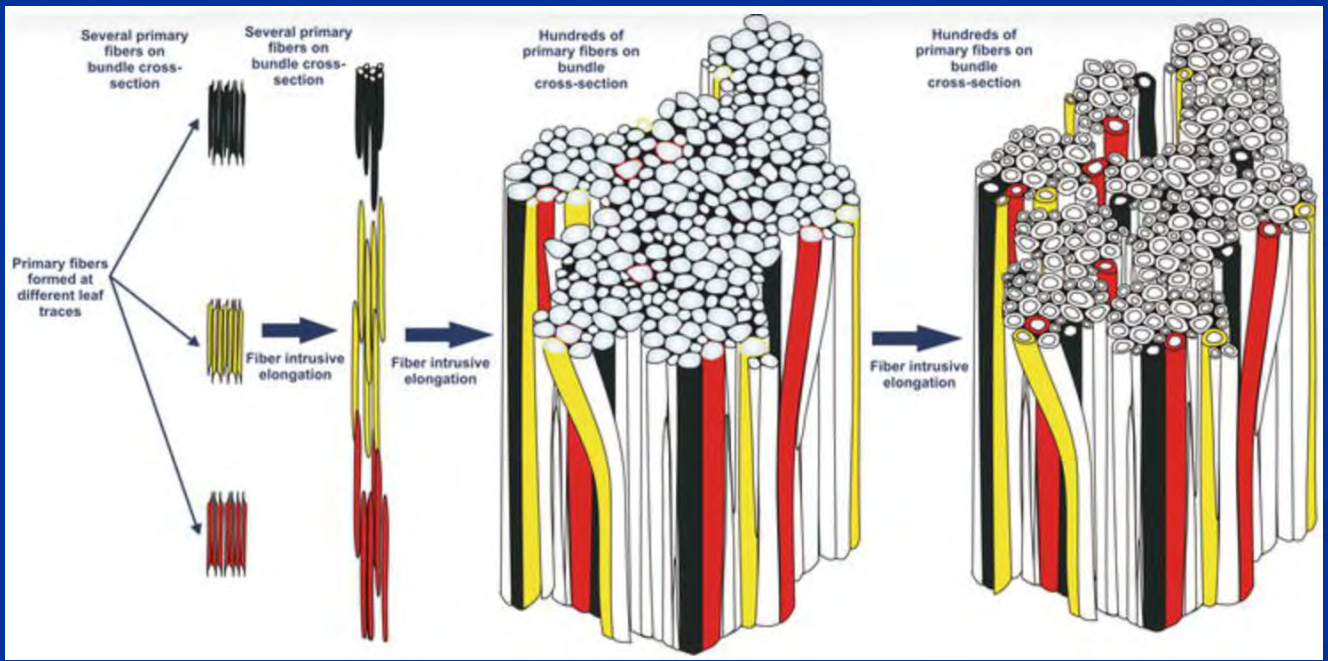
Hemp fiber's tensile strength is slightly lower than chrysotile

Structure of Hemp Fibers

690 – 1,000 MPa or
100,050 – 145,000 Psi

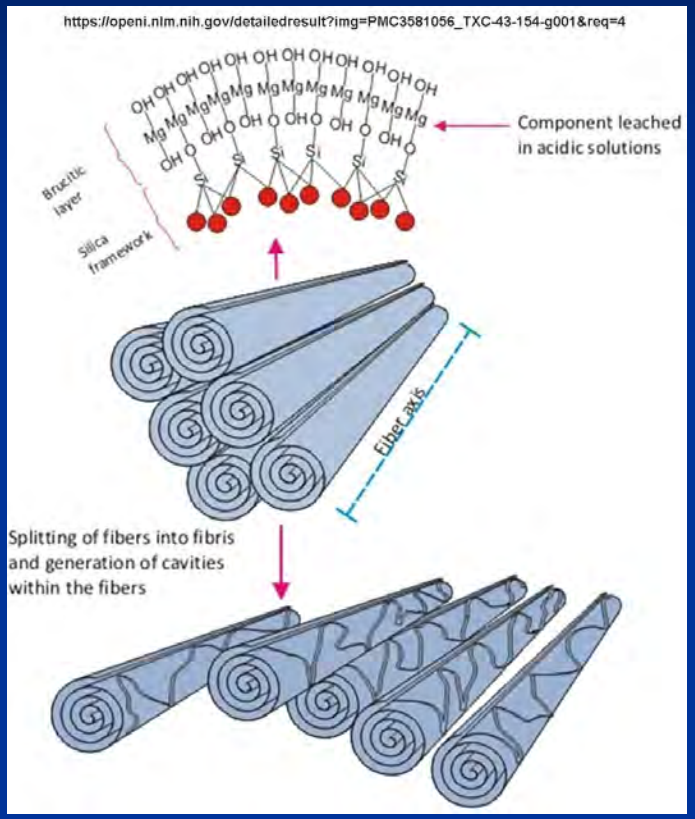
Zhao, S. et. al. (2021) The Physical and Chemical Properties of Hemp Fiber Prepared by Alkaline Pectinase-Xylanase System. https://doi.org/10.21203/rs.3.rs-451112/v1.

Hemp fiber's microtube structure resembles chrysotile

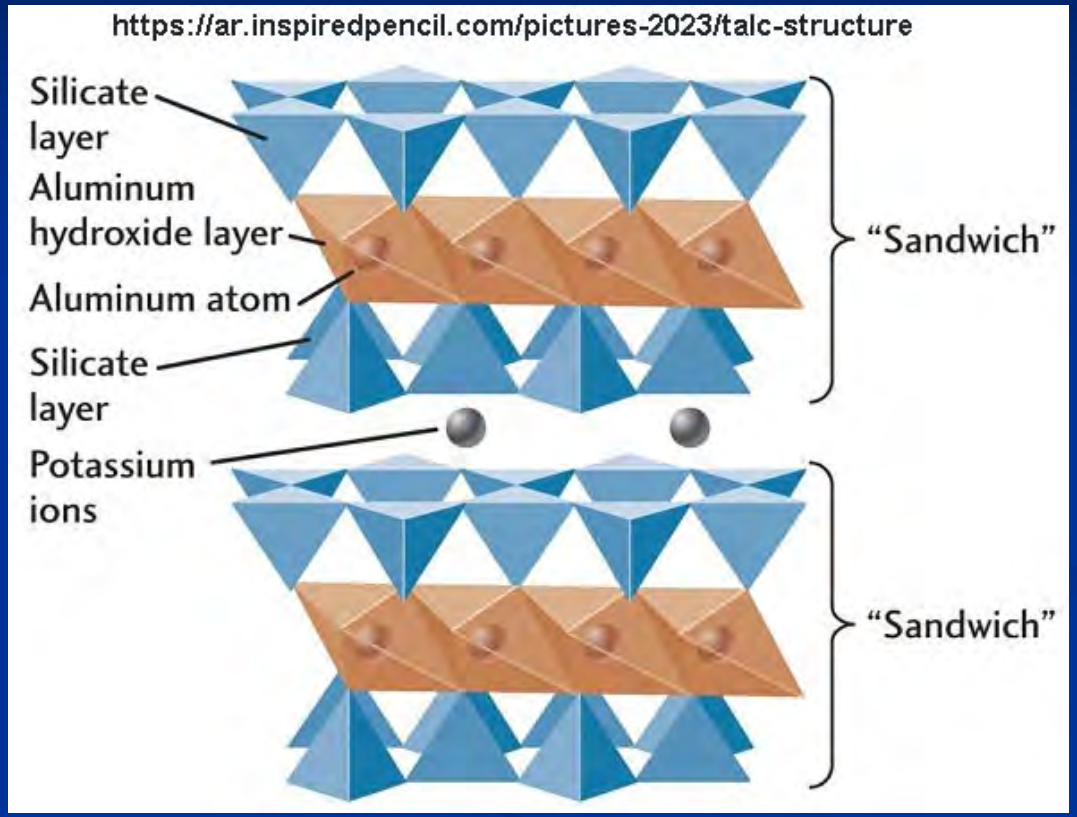


Chrysotile and Talc Are Drastically Different in Tensile Strength

Chrysotile $Mg_3Si_2O_5(OH)_4$



Talc $Mg_3Si_4O_{10}(OH)_2$

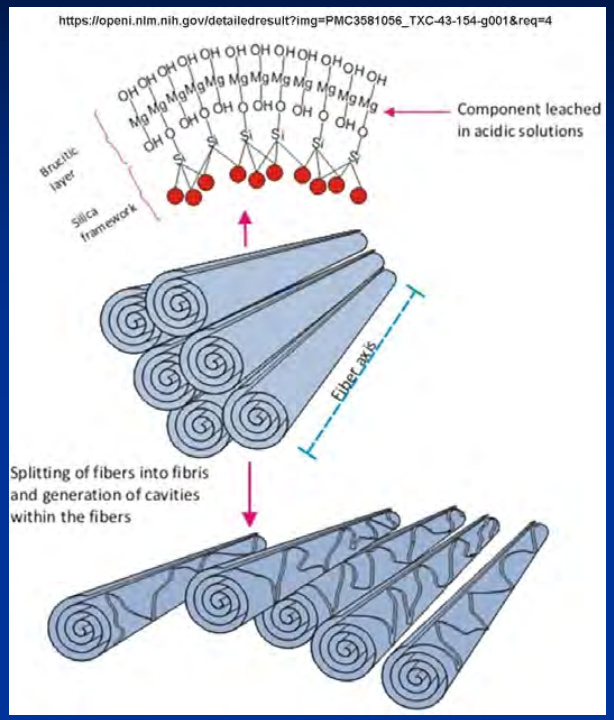


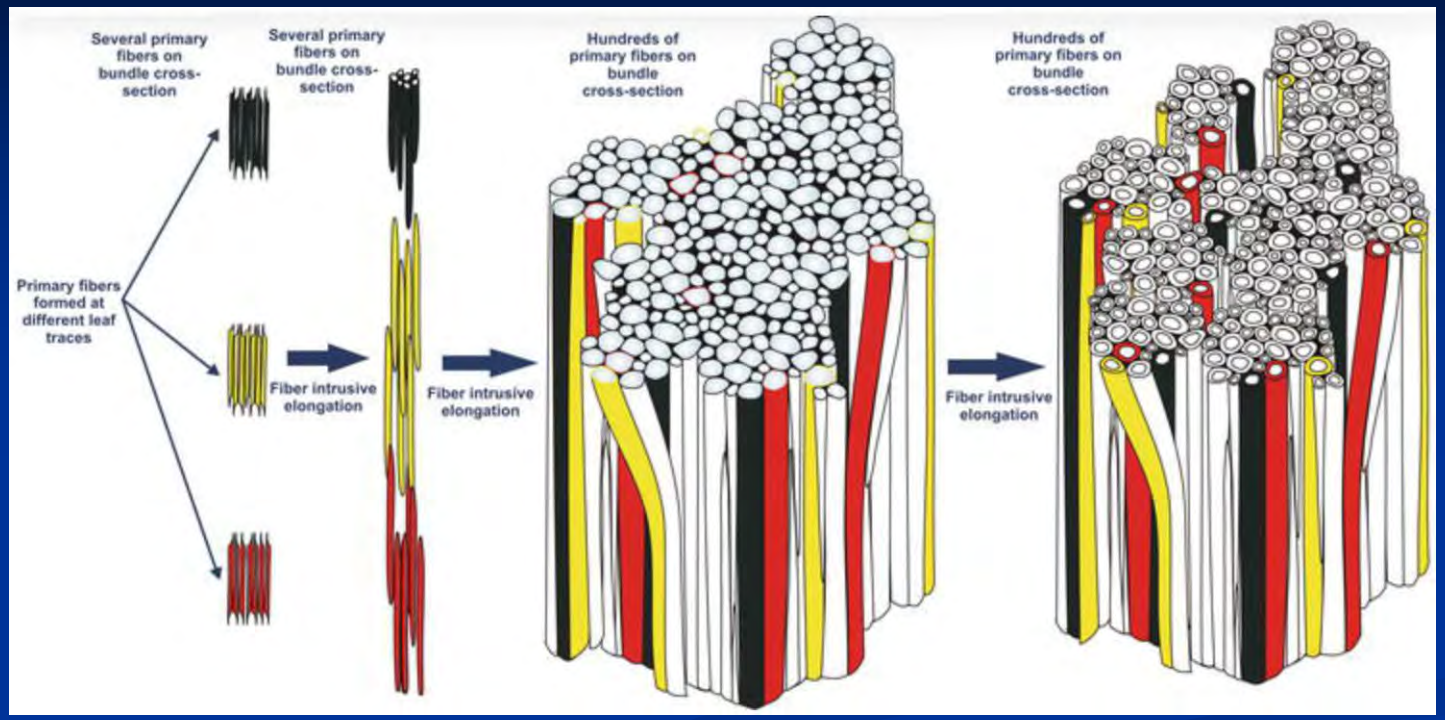
The nanotube structure makes the chrysotile even stronger.

Bonding is weak between and within TOT layers, making talc easily crushable.

Chrysotile's tensile strength is more than 30 times that of talc. With such a high tensile strength, chrysotile does not break down into 325 mesh-size or < 44 μm particles in the milling process of talc.

Chrysotile and Hemp Fiber Are Similar in Tensile Strength





- **The hemp's microtube structure is similar to the nanotube structure of chrysotile, making it also very strong.**
- **Their tensile strengths are similar.**
- **Both are used as the reinforcement components of composite materials**

How Strong Are Chrysotile and Hemp Fiber?

The strong chrysotile fibers are used for various applications.

The strong hemp fibers are used for the construction composite materials.

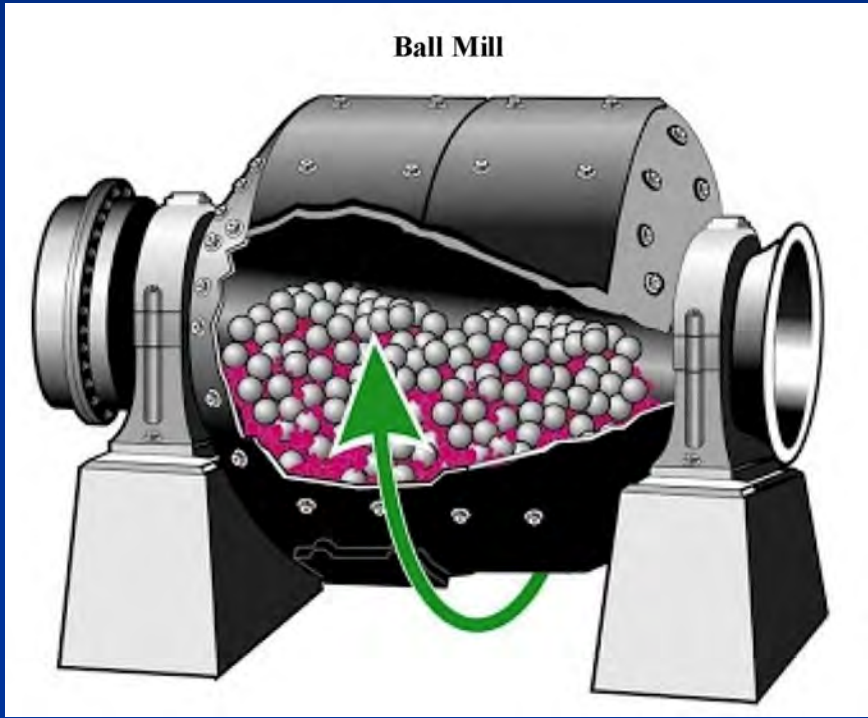
How These Materials Behave During Mechanical Grinding?

Their high tensile strength and strong bonding make them hard to break into fine powders.

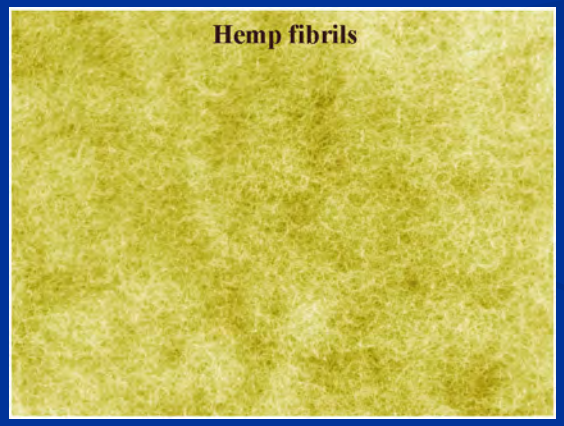
Their softness and weak bonding make them easily break into fine powders.

When Crystal Sugar and Hemp Fibers Are Ground Together

If hemp fibers and sugar crystals are ground together



The same is true for talc and chrysotile. USP's research work has proven it.



Hemp fibers are crushed and broken into fibrils, but not into fine powders like sugar crystals.

Sugar crystals quickly break into fine powders

USP's experts have conducted extensive research on the topic of asbestos-containing talc.

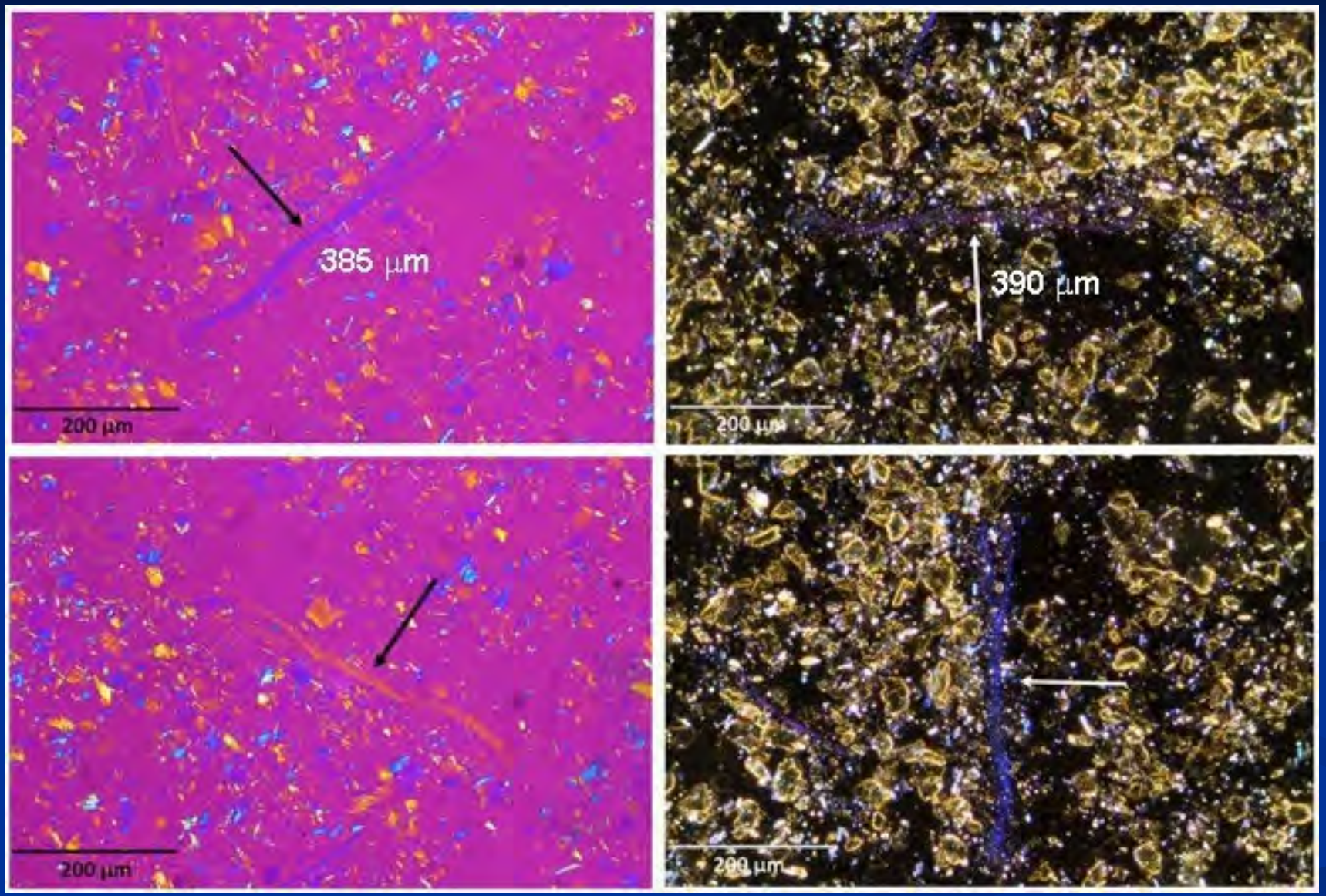
They wanted to find out how the finished talcum baby powder product should look if the raw talc material contained asbestos.

They spiked an asbestos-free talc sample with asbestos minerals chrysotile and tremolite from NIST SRM 1866 at different concentration levels.

To mimic the baby powder manufacturing process, they ground the asbestos-spiked talc sample inside a balling mill until the talc's particle size reached the commercial specification of the finished baby powder product: under 44 micrometers.

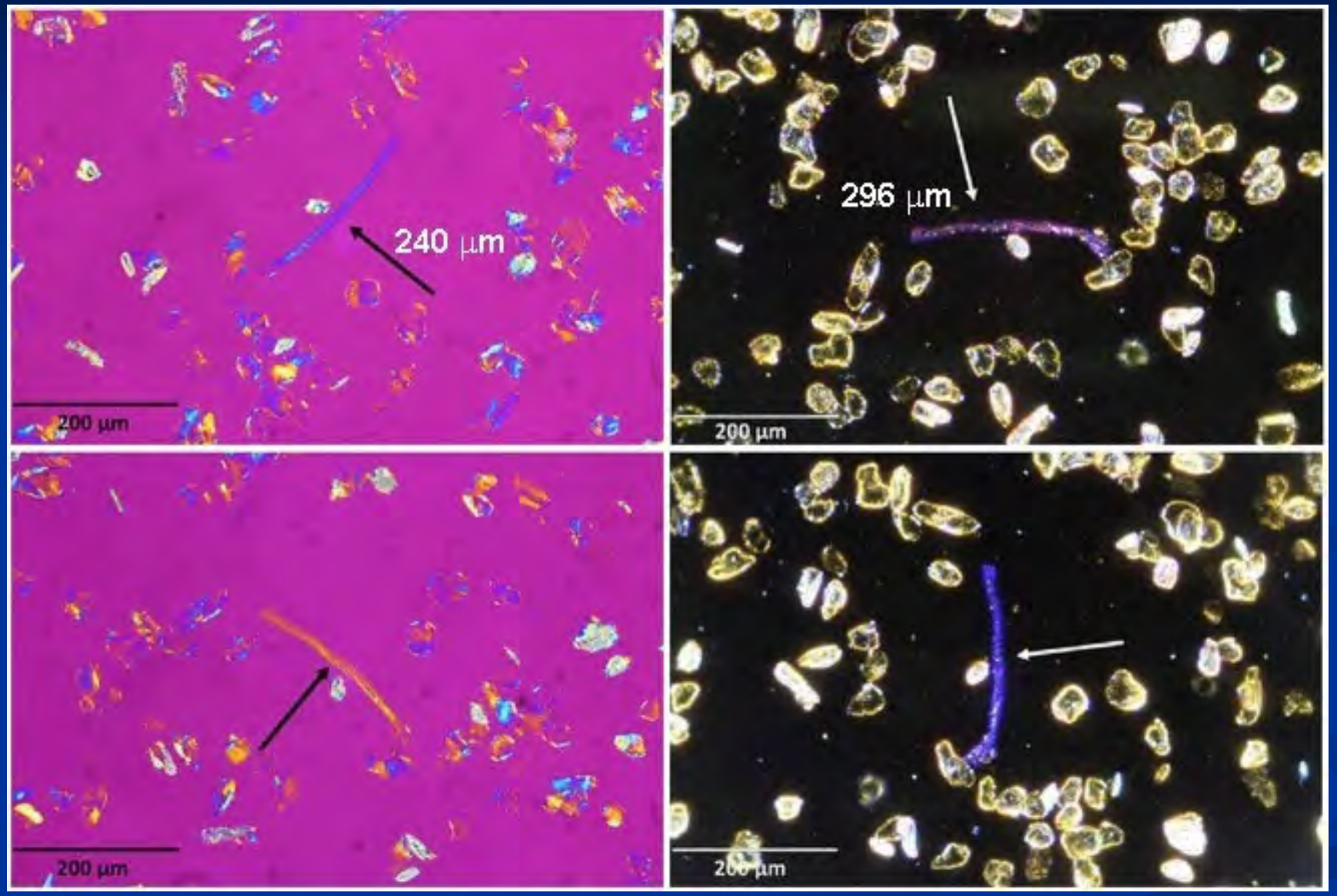
USP's experts studied the finished baby powder samples using various microscopic techniques. The following are pictures taken under optical microscope.

NIST Standard Chrysotile in Talcum Powder (USP, 2022)



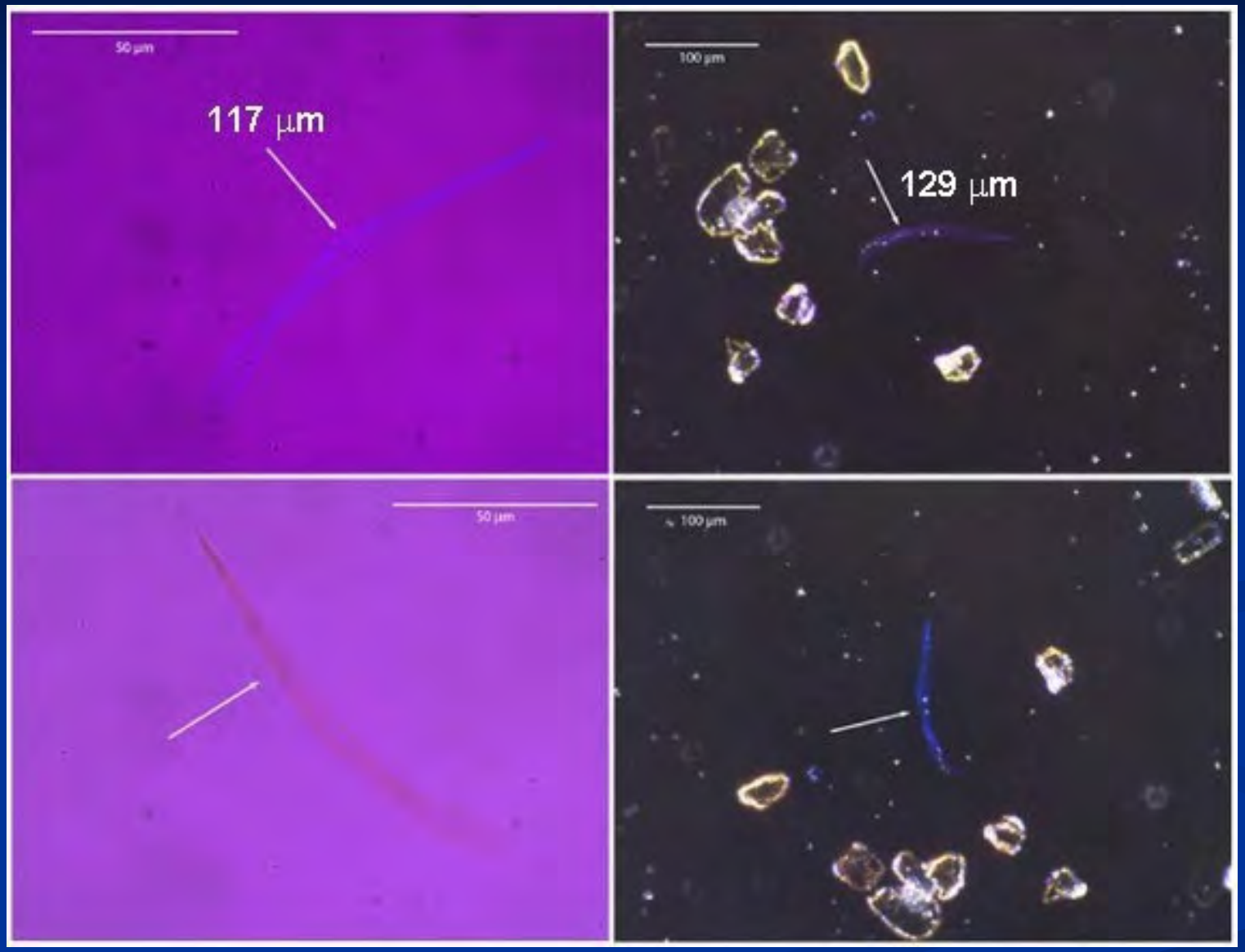
0.1% standard Chrysotile-spiked talc. Chrysotile fibers' lengths are much longer than talc particles.

NIST Standard Chrysotile in Talcum Powder (USP, 2022)



0.01% standard Chrysotile-spiked talc. Chrysotile fibers' lengths are much longer than talc particles.

NIST Standard Chrysotile in Talcum Powder (USP, 2022)

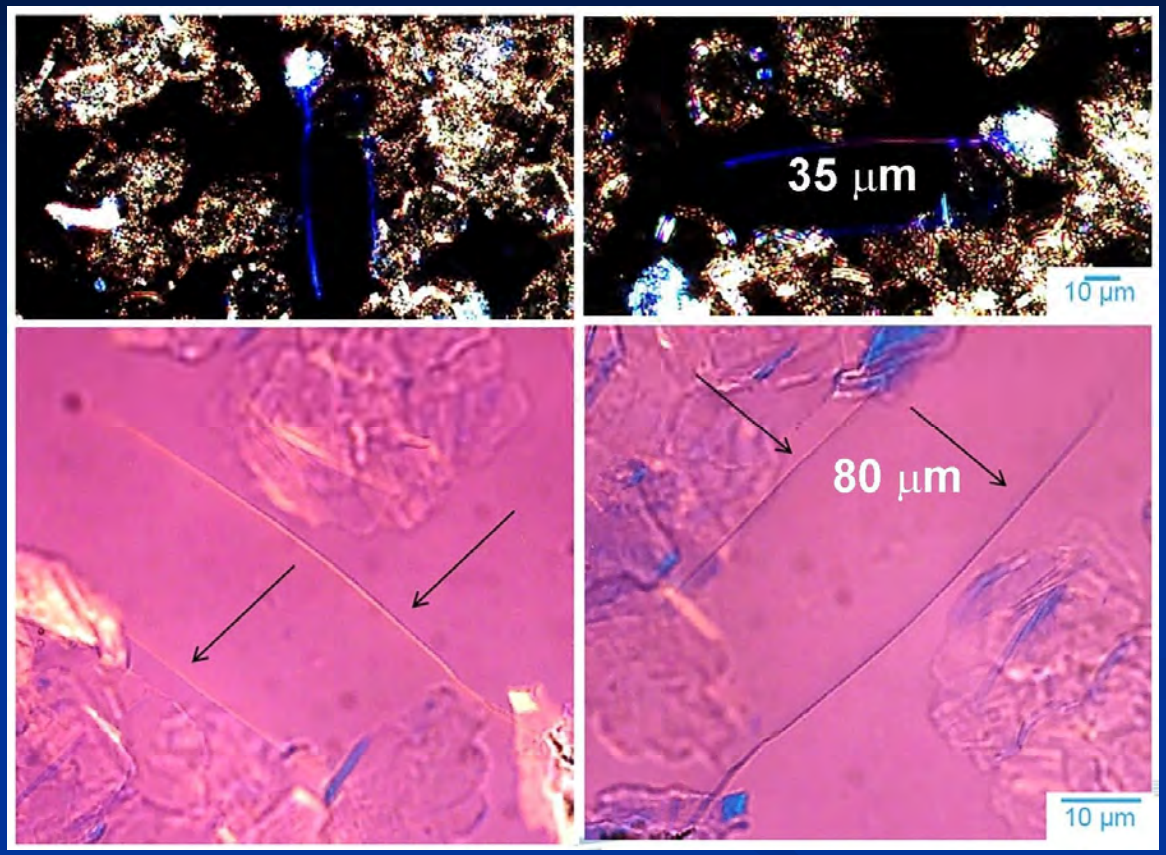


0.001% standard Chrysotile-spiked talc. Chrysotile fibers' lengths are much longer than talc particles.

Calidria Chrysotile in Talc Powder Samples

The above are all NIST standard chrysotile.
How about Calidria chrysotile?

Calidria Chrysotile in Talcum Powder (Pier, 2017)



0.05% Calidria chrysotile-spiked talc powder under PLM.
After talc is ground into the baby powder particle sizes (325 mesh or < 44 μm),
There are still longer (80 mm) Calidria chrysotile in the sample.

Conclusions Derived from the Above Evidence

- **The minute amount (e.g. 0.0003 – 0.0006%) of chrysotile found in J&J baby powder products by MAS must have been formed together with talc during the geological formation process. When the raw talc rock ore is used to produce baby powder products, the chrysotile is ground together with talc in balling mills.**
- **Because of its extremely high tensile strength chrysotile crystals do not break down to the same particle size range as talc crystals. Therefore, the particles of the same size as talc particles cannot be chrysotile.**

Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

Incorrect Quantification Procedure

MAS's Quantitation Procedure Defies Common Sense

REMOTE DEPOSITION OF WILLIAM E. LONGO, PhD
March 22, 2024

So, okay, well, let's -- and that's why the SG-210 is so valuable because it's about the same size.

So then you take what the recovery is, you know, and then you can calculate what -- all our reports will have a weight corrected, that's the measurement of the difference between the heavy fraction and the light fraction.

Q. And the percentage reporting, is that like a qualitative visual estimate from what the analyst is seeing on the slides as opposed to a quantitative calculation when I look at that, your PLM reports on chrysotile on Johnson & Johnson samples?

A. Yes. There's only two ways that you can do the estimated weight percent. You can do point counting, which we don't do because we found it not very accurate, but you have a visual estimate of the percentage you're seeing and that's what you write down, and it's usually a range.

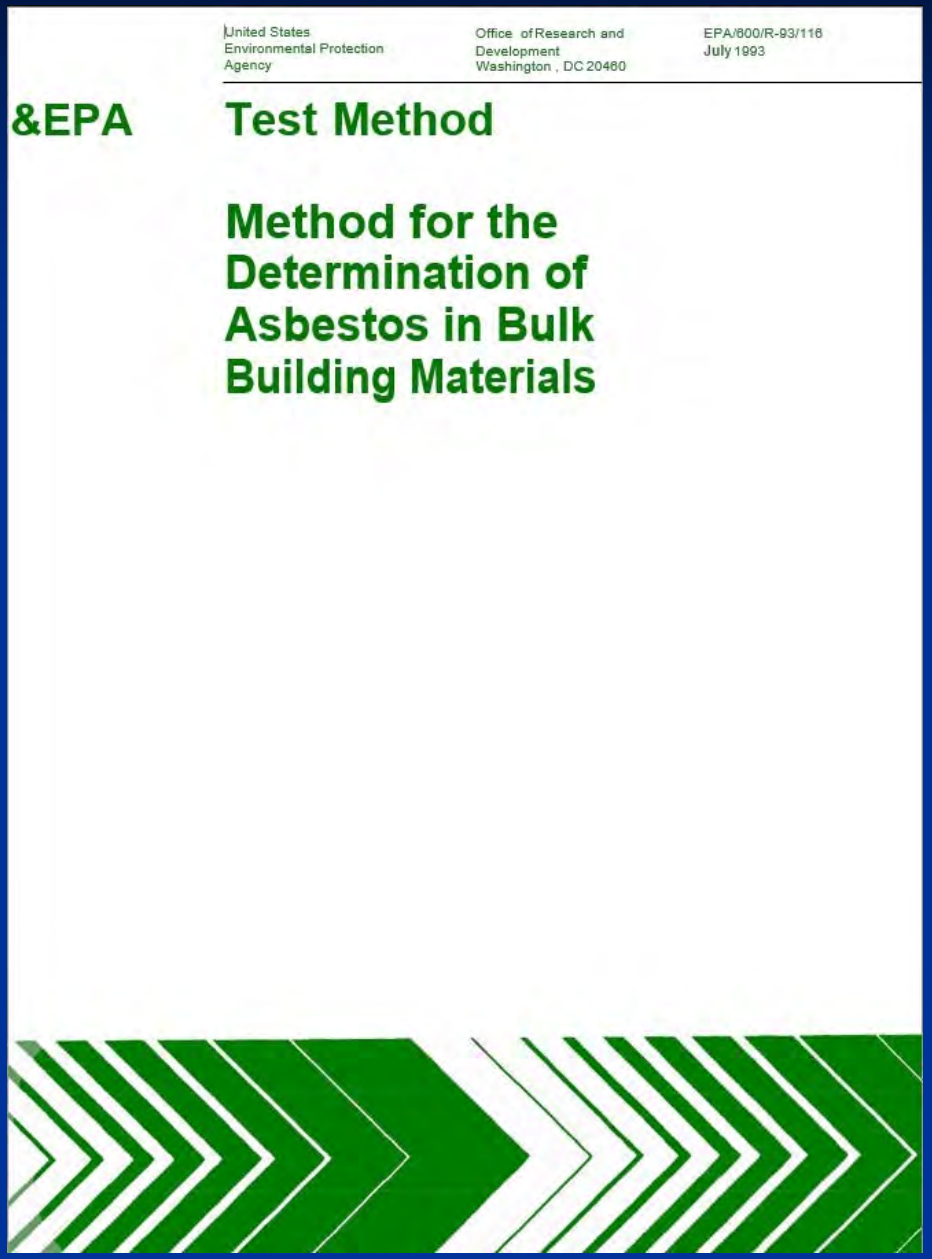
Q. Okay. That's what your laboratory does, this sort of visual estimate of what you're seeing in terms of area by a percent basis, right?

A. Right.

Q. Okay. And then when I see -- you know, when you report that in terms of chrysotile bundles per gram, the way that you calculate that number for

In Dr. Longo's deposition on March 22, 2024 he claims that EPA's Point Counting is not very accurate and used Visual Estimate for quantitation

MAS Did Not Follow EPA's Quantitation Procedure



United States Environmental Protection Agency | Office of Research and Development Washington, DC 20460 | EPA/600/R-93/116 July 1993

&EPA

Test Method

Method for the Determination of Asbestos in Bulk Building Materials

Baby powder is a friable material.

This Latin adjective comes from the verb "friare," which means "**to crumble**." "Friare" in turn is related to the verb "fricare" ("to rub"), the source of the English noun "friction." "Friable" is used to describe something that can be easily reduced to a powdered form. In contemporary usage, it is often found in the discussion of asbestos.

Friable Definition & Meaning - Merriam-Webster

Point counting quantitation is required by U.S. EPA (1982) EPA-600-82-020 Interim method for the determination of asbestos in friable materials.

1.7.2.4 Quantitation of Asbestos Content

Asbestos quantitation is performed by a point-counting procedure.

MAS did not follow the official EPA 600 M4 82-200 point counting procedure for quantitation of asbestos content in friable materials.

Reference Chart for Visual Estimate (Su, 2022)

THE MICROSCOPE
Vol. 69:4, pp 160–162, 2022
https://doi.org/10.59082/RPCG4507

Area Percentage Charts to Aid Visual Estimation of Asbestos Concentration in Bulk Asbestos Samples

Shu-Chun Su, Ph.D.
Technical Expert, National Voluntary Laboratory Accreditation Program
National Institute of Standards and Technology

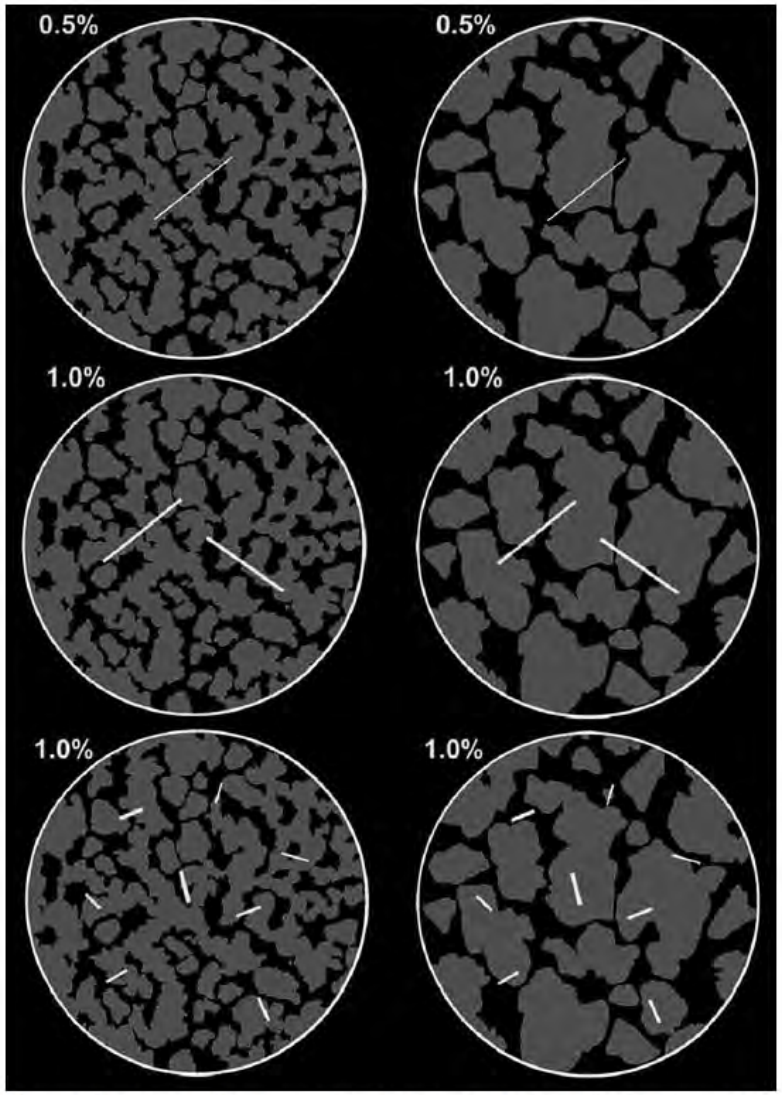


Figure 3. 0.5–1.0% with 65% of the field of view filled with matrix.

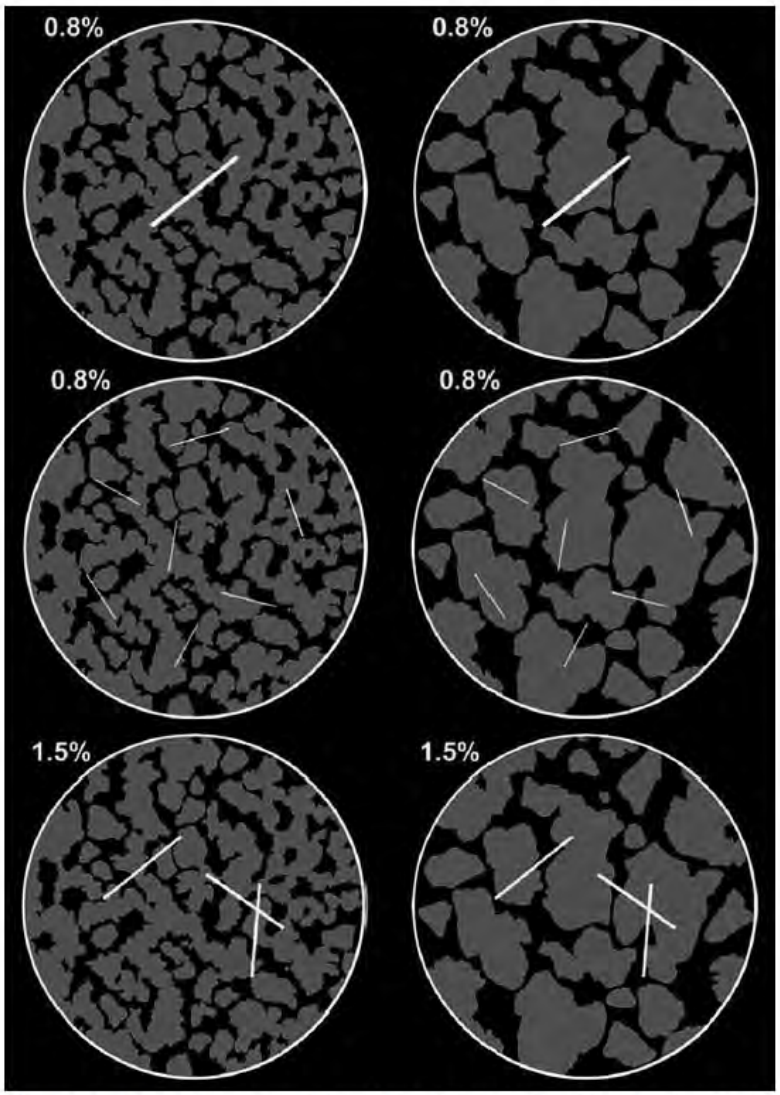
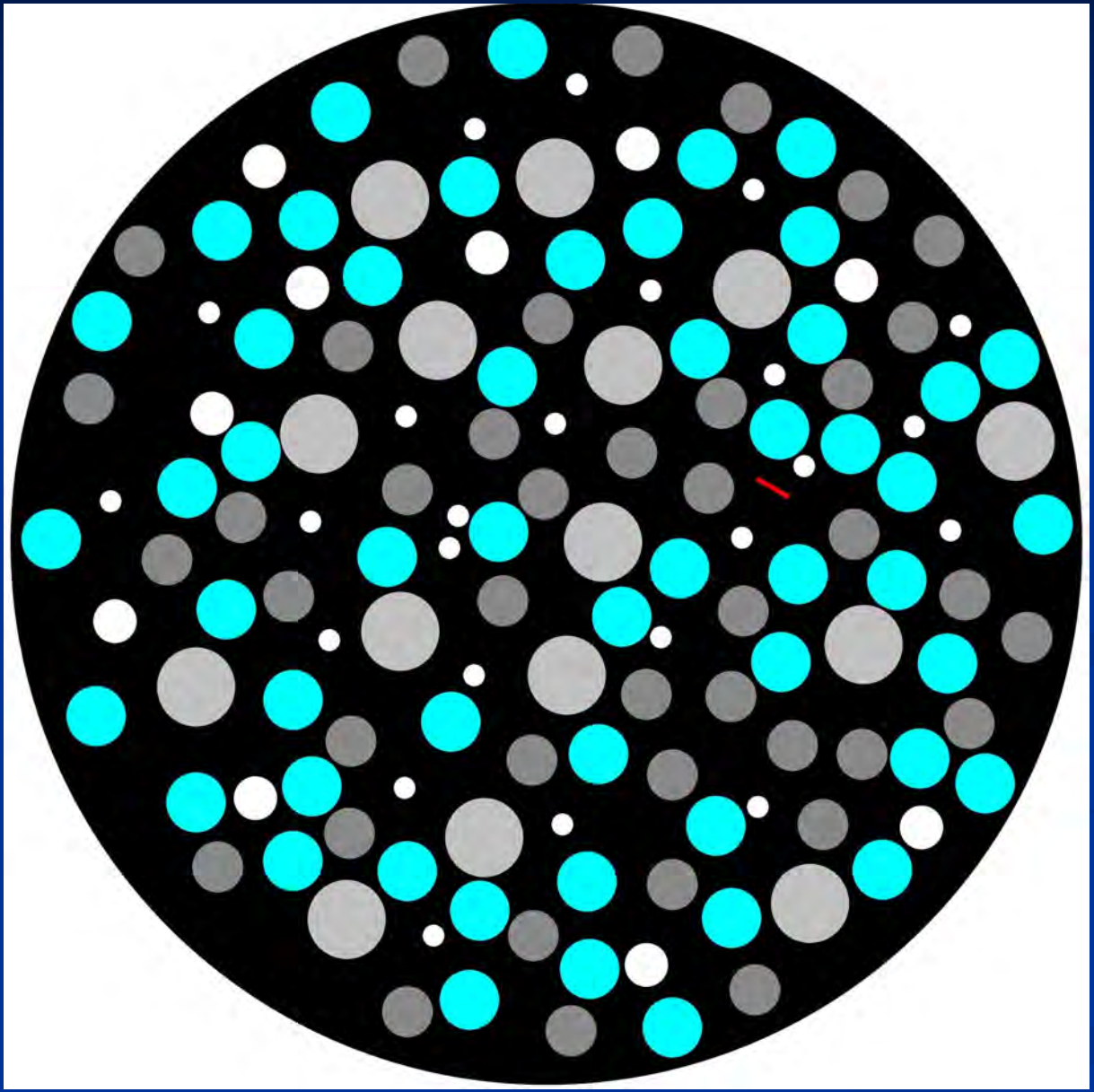


Figure 4. 0.8–1.5% with 65% of the field of view filled with matrix.

These are the asbestiform reference charts at 0.X% to meet AHERA requirement for differentiating ACM (asbestos containing material) from Non-ACM. The differentiating factor is 1% by weight:

ACM > 1%
Non-ACM ≤ 1%
These charts have been widely used by US asbestos laboratories and were formally published in 2022 by Shu-Chun Su.

Can the Asbestos % in the Image be Visually Estimated?



The red fiber is asbestos. The round objects are talc particles.

There is no established analytical protocol to do Visual Estimate at such low concentration levels.

Can 0.002 – 004% Be Visually Estimated?

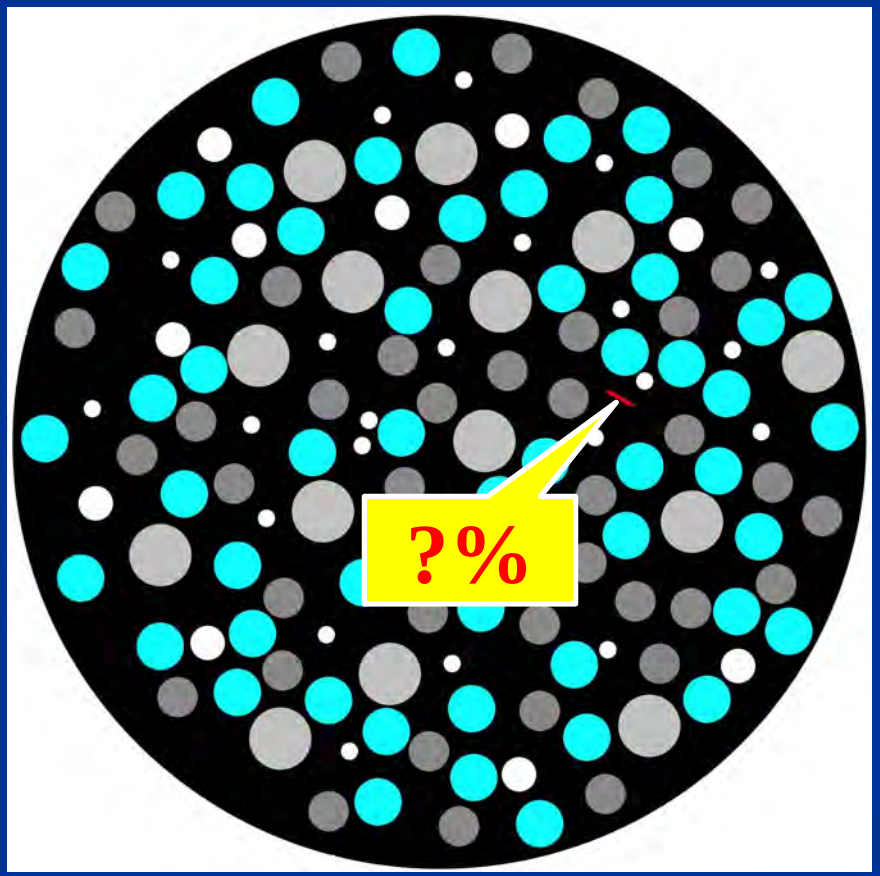
2023-02-28 - Valadez Bottle Report

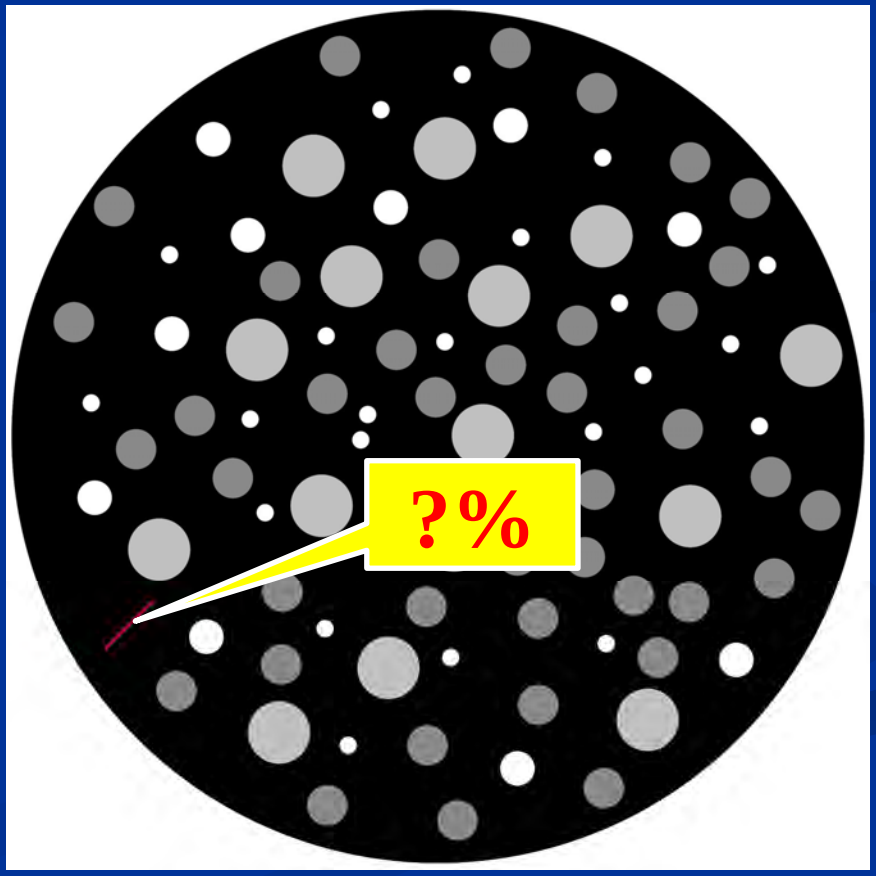
Table 2
Overall Summary of the JBP Asbestos Sample Analysis Results

MAS Sample #	ATEM Amphibole Asbestos	ISO-NY PLM Wt. % Amphibole Asbestos	CSM-PLM w/o HLS Chrys %	CSM Weight Recovery Light fraction	CSM Chrys % Weight Corrected**
M71614-001	<52,000	NSD	0.002-0.004	15.8%	0.0003-0.0006

*NSD: No Structure Detected **Weight Corrected

- According to Dr. Longo's March 22, 2024 deposition, the 0.002 – 004% CSM-PLM w/o HLS Chrys% was visually estimated.
- Can anyone visually estimate the red fiber's percentages among the matrix round objects?





Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

Impossible Error Rate of Visual Estimate

MAS's 0.005% Error Rate Defies Common Sense

REMOTE DEPOSITION OF WILLIAM E. LONGO, PhD
April 2, 2024

Kayme Clark (NJ) - WilliamLongoVol2-20240402.PDF

these than I do. So, it's just a visual estimate.
It's their opinion.
Q. And it's a qualitative number, qualitative assessment, right?
A. A visual estimate -- it typically may have an error rate of .005 percent or something. They're all qualitative. Every time somebody does PLM and puts a weight percent down, it's called qualitative.
Q. Okay. That error rate that you just referenced, where did you pull that from? That's not from your --
A. It --
(Court Reporter clarification.)
BY MR. HYNES:

Priority-One Court Reporting Services Inc. – A Veritext Company
718-983-1234

LONGO, Ph.D. - DIRECT

Page 186

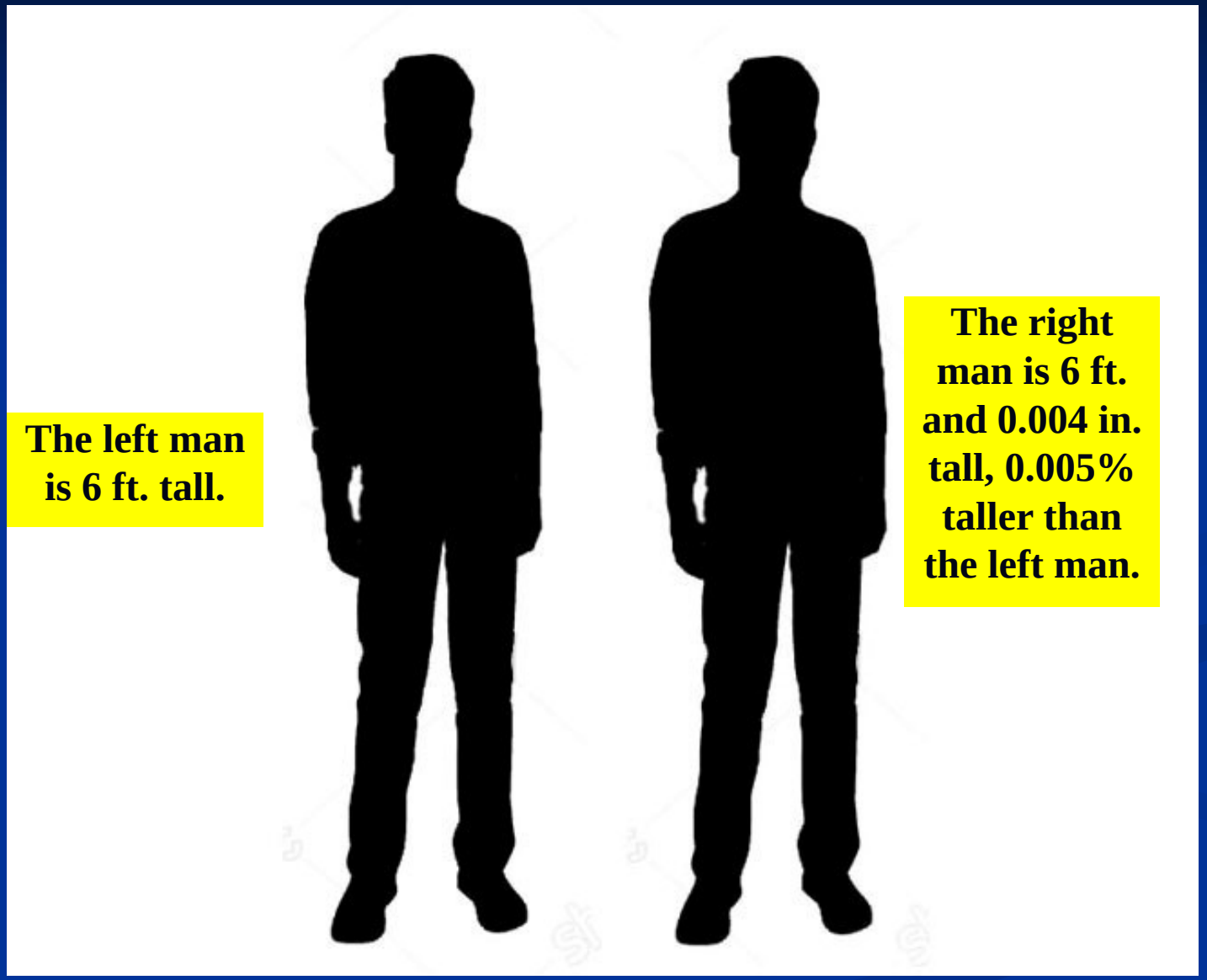
Q. I was going to say, that error rate isn't specific to this chrysotile by PLM?
A. No. It's more specific. And, typically, NVLAP, they would send you a known sample, and you had a range of where it could be. You know, if it was 10 percent. And I forget what they allowed before they started knocking points off.
Q. So, that is based on NVLAP

In Dr. Longo's April 2, 2024 deposition, he claimed that MAS's typical error rate of Visual Estimate was 0.005%

It is not qualitative but quantitative.

NVLAP's acceptable error rate of Calibrated Visual estimate or CVE is a single-digit percentage, for example, ± 5%, not an error rate at the third decimal place.

The 0.005% Error Rate of Visual Estimate Defies Common Sense



Can a human being visually tell the difference that the right man is taller by 0.004 inches? No.

Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

Incorrect Extrapolation Procedure.

MAS's Analytical Results of J&J Talcum Powder

Valadez J & J Baby Powder Container

MAS's Analytical Results of J&J Talcum Powder

2023-02-28 Valadez Bottle Report

Table 2
Overall Summary of the JBP Asbestos Sample Analysis Results

MAS Sample #	ATEM Amphibole Asbestos	ISO-NY PLM Wt. % Amphibole Asbestos	CSM-PLM w/o HLS Chrys %	CSM Weight Recovery Light fraction	CSM Chrys % Weight Corrected**
M71614-001	<52,000	NSD	0.002-0.004	15.8%	0.0003-0.0006

*NSD: No Structure Detected **Weight Corrected

Table 3
Overall Summary of the Calculated Chrysotile
BIR CSM-PLM Data
(RI Fluid 1 650)

MAS Sample #	Chrysotile RI Values CSM-PLM	Birefringence Calculations
M71614-001	1.568-1.564 1.564-1.557	0.004-0.007 avg. = 0.006
	α range γ 1.564-1.557 1.568-1.564	Avg. = 0.006

Table 6
Chrysotile
Range of Parallel and Perpendicular RIs

Chrysotile Bundle No.	RI Fluid	CSM PLM (with HLS) Parallel RI	CSM PLM (with HLS) Perpendicular RI	BIR Calculations γ - α
M71614-001	1.560			
1		1.564	1.561	0.003
2		1.565	1.561	0.003
3		1.568	Avg. 1.559	0.009
4		Avg. 1.567	Avg. 1.562	0.005
		Avg. 1.566	Avg. 1.561	0.005

Estimation of the Number of Chrysotile Bundles Detected for CSM PLM Methods

Using the number of chrysotile bundles counted during the PLM analysis, and the amount of talcum powder analyzed in a specified area on the cover slip mount per the two glass slides, the amount of chrysotile bundles per gram of talcum powder sample can be calculated.

Total chrysotile bundles in the sample is calculated as shown in the following equation:

$$(A1 \div A2) \times (CB) \div W = TCB/W$$

Where:
A1: The total area (972 mm²) that the talcum powder occupies on the two glass slides.
A2: The area (23.56 mm²) in thirty fields of view that the talcum powder occupies on the two glass slides.
CB: Number of chrysotile bundles detected in a positive sample by PLM analysis.
W: Weight of total talcum powder placed on the two glass slides.
TCB/W: Total number of chrysotile bundles per weight (grams) of talcum powder.

The results of CSM sample preparation analysis calculations are shown in Table 4.

Table 4
Summary of Estimated Chrysotile Bundles per gram Calculations
For the CSM PLM Results

MAS Sample #	wt. of sample grams	No. of Chrys Bundles counted	CSM/ISO Chrysotile Bundles/g	CSM/ISO* Chrysotile Bundles/g
M71614-001	0.0007	6	354,000	56,000*
			Avg. = 354,000	Avg. = 56,000*

Weight corrected*

MAS's Conclusions

- **This baby powder contains 0.0003 – 0.0006% of chrysotile.**
- **Each gram of talc contains 56,000 chrysotile bundles.**

MAS PLM Extrapolation Procedure is Unpublished, Unvalidated, Unreliable, and Not Scientifically Justified

Estimation of the Number of Chrysotile Bundles Detected for CSM PLM Methods

Using the number of chrysotile bundles counted during the PLM analysis, and the amount of talcum powder analyzed in a specified area on the cover slip mount per the two glass slides, the amount of chrysotile bundles per gram of talcum powder sample can be calculated.

Total chrysotile bundles in the sample is calculated as shown in the following equation:

$$(A1 \div A2) \times (CB) \div W = TCB/W$$

Where:

A1: The total area (972 mm^2) that the talcum powder occupies on the two glass slides.

A2: The area (23.55 mm^2) in thirty fields of view that the talcum powder occupies on the two glass slides.

CB: Number of chrysotile bundles detected in a positive sample by PLM analysis.

W: Weight of total talcum powder placed on the two glass slides.

TCB/W: Total number of chrysotile bundles per weight (grams) of talcum powder.

The results of CSM sample preparation analysis calculations are shown in Table 4.

Table 4
Summary of Estimated Chrysotile Bundles per gram Calculations For the CSM PLM Results

MAS Sample #	wt. of sample grams	No. of Chrys Bundles counted	CSM/ISO Chrysotile Bundles/g	CSM/ISO* Chrysotile Bundles/g
M71614-001	0.0007	6	354,000	56,000*
			Avg. = 354,000	Avg. = 56,000*

Weight corrected*

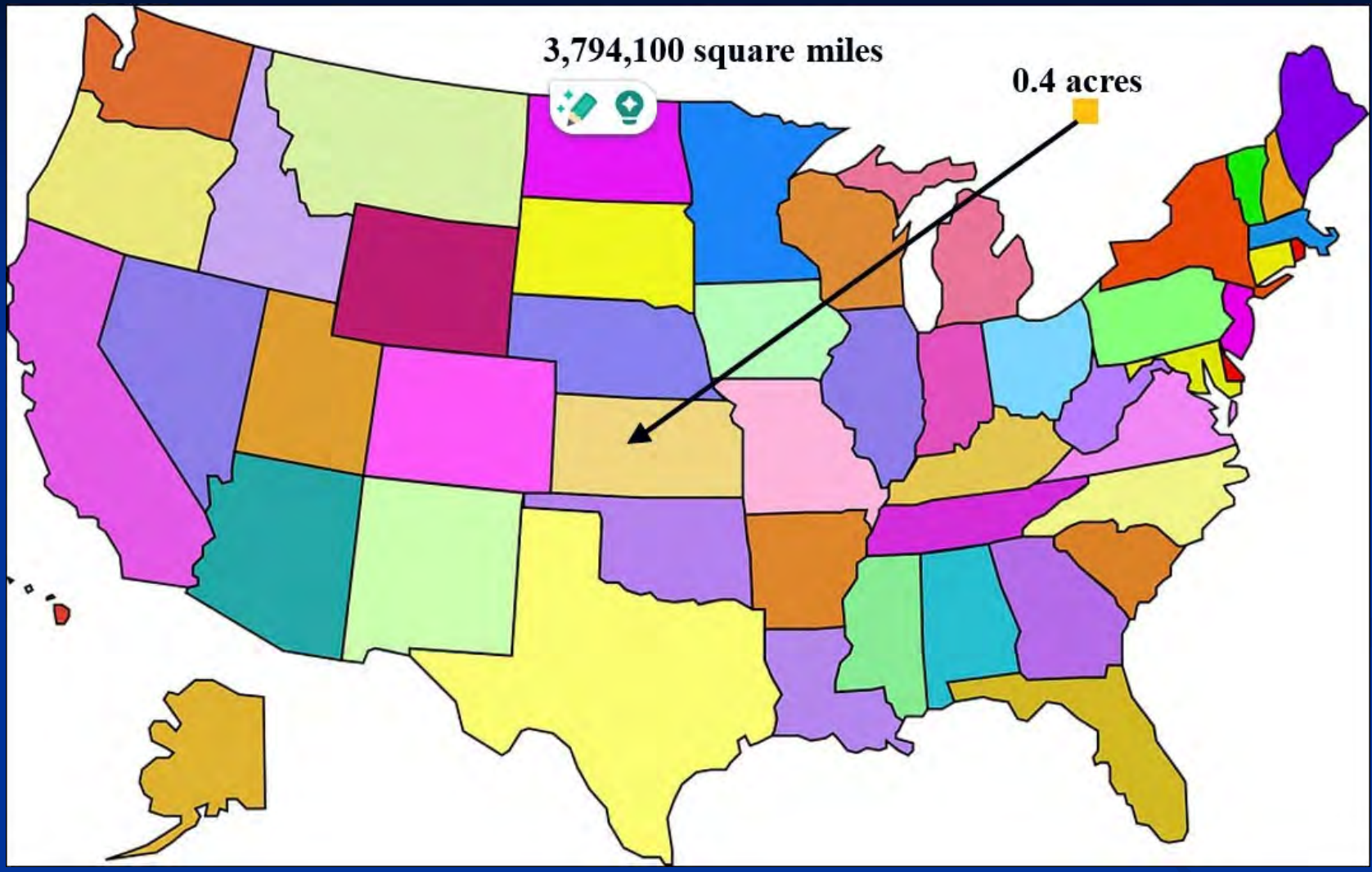
Out of a 1.5 oz. container, MAS separated out 0.0007 grams of talc powder for analysis.

Out of the 0.0007 grams sample, Only 2.4% or 0.000017 grams was actually counted.

Based on the counting results of the 0.000017-gram sample, MAS concluded that one gram of talc powder contains 56,000 chrysotile bundles.

The results of 0.000017 grams were extrapolated to 1 gram of talc powder. The extrapolation factor is 58,824 times!

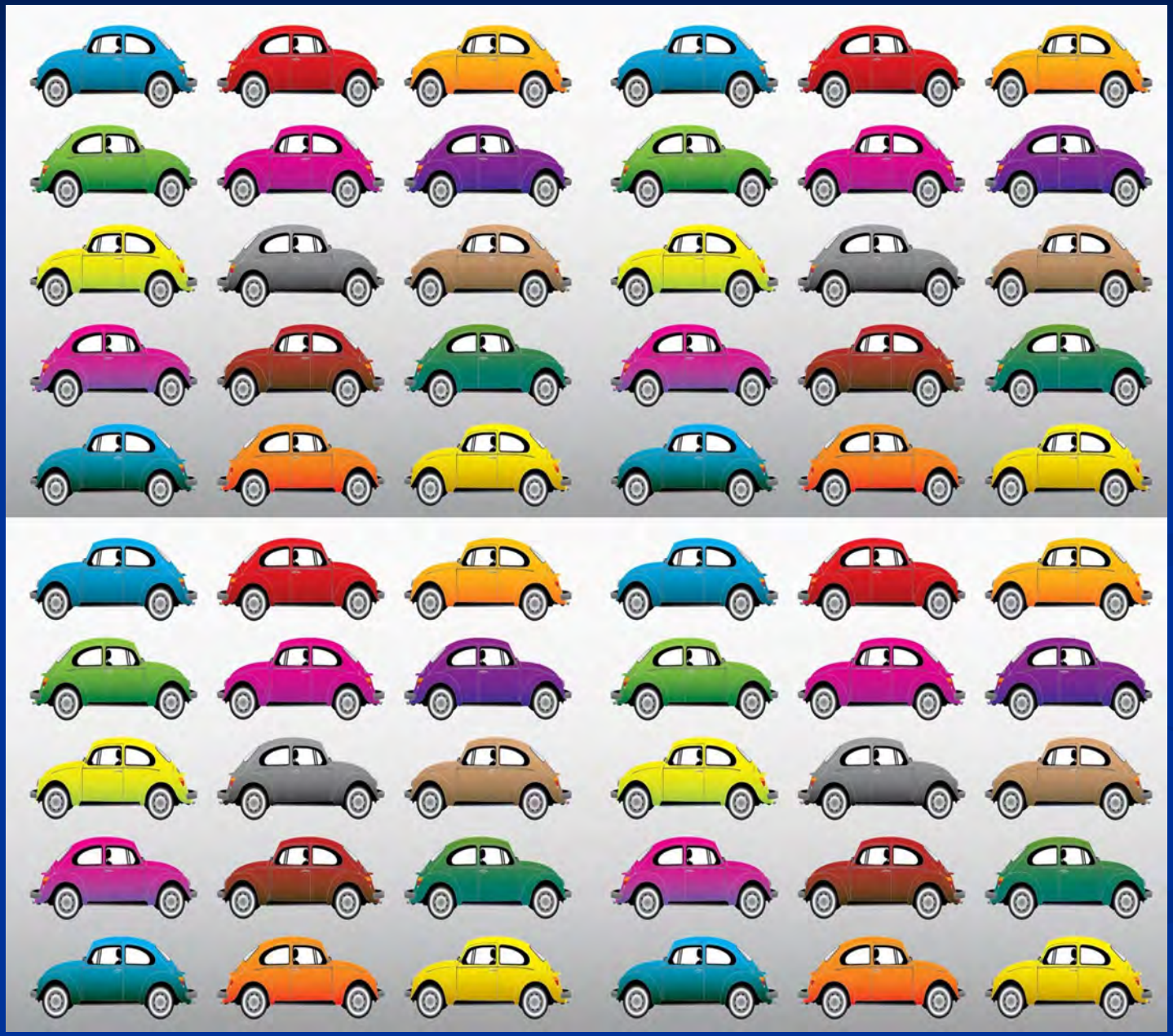
0.000017-Gram PLM Results Extrapolated to 1 Gram of Talc



The total area of the United States is three million seven hundred ninety-four thousand one hundred square miles. Using 0.000017-gram results to extrapolate to 1 gram of talc is like using a survey of the soil of a 0.4-acre backyard in a Kansas home to represent the soil of the whole United States.

0.000017-Gram PLM Results Extrapolated to 1 Gram of Talc

A motor vehicle plant produces 58.000 cars in a year.



Using the measurement results of 0.000017 grams sample to evaluate 1 gram of talc is like using the Quality Control check results of one vehicle to represent all 58,000 vehicles produced in a year. It is not an acceptable practice.

0.000017-Gram PLM Analysis is Far From Sufficient to Ensure a < 5% False Positive

- Any analytical procedure has errors. Asbestos analysis is no exception.
- There are two types of analytical errors: Type 1 – False Positive and Type 2: False Negative.
- For litigation-related analysis, the False Positive error rate must be kept under 5% or 1%
- In other words, the analytical procedure's Confidence Level (CL) must be at least 95% to ensure a < 5% False Positive error rate.
- In product liability analysis, a 95% CL test has a 5% probability of wrongly implicating an innocent product.
- MAS should pay more attention to the established sampling protocol and arbitrarily choose the amount of sample to be analyzed, which results in unacceptable False Positive rates.

A Sample Size of 0.000017-Grams is Far From Sufficient to Ensure a < 5% False Positive

Equation for Calculating Sample Size

$$n = p(1-p)\left(\frac{z}{E}\right)^2$$

where

- n – sample size that is large enough to attain the specified maximum allowed error and confidence level
- p – a rough estimate of population proportion (B%)
- E – MAE (maximum allowed error)
- z – critical value from normal distribution corresponding to the specified confidence level
  - $z = 1.96$ for 95% confidence level
  - $z = 2.575$ for 99% confidence level

Nate: 1. Given z and p, this equation can be used to calculate the margin of error associated with a specific n

2. The derivation of this equation is omitted in this presentation, which can be found in general probability/statistics texts

June 10, 2008 Shu-Chun Su: CARB M-435 22 of 40

All reliable methodologies require a sample size calculation to ensure a 95% Confidence Level and keep the False Positive error rate under 5%. Above is an example that I provided to the California Air Resources Board in 2008.
MAS did not perform any such calculation as part of its PLM methodology, which is scientifically inappropriate.

A Sample Size of 0.000017-Grams is Far From Sufficient to Ensure a < 5% False Positive

Equation for Calculating Sample Size

$$n = p(1-p)\left(\frac{z}{E}\right)^2$$

where

- n – sample size that is large enough to attain the specified maximum allowed error and confidence level
- p – a rough estimate of population proportion (B%)
- E – MAE (maximum allowed error)
- z – critical value from normal distribution corresponding to the specified confidence level
  - $z = 1.96$ for 95% confidence level
  - $z = 2.575$ for 99% confidence level

Nate: 1. Given z and p, this equation can be used to calculate the margin of error associated with a specific n

2. The derivation of this equation is omitted in this presentation, which can be found in general probability/statistics texts

June 10, 2008 Shu-Chun Su: CARB M-435 22 of 40

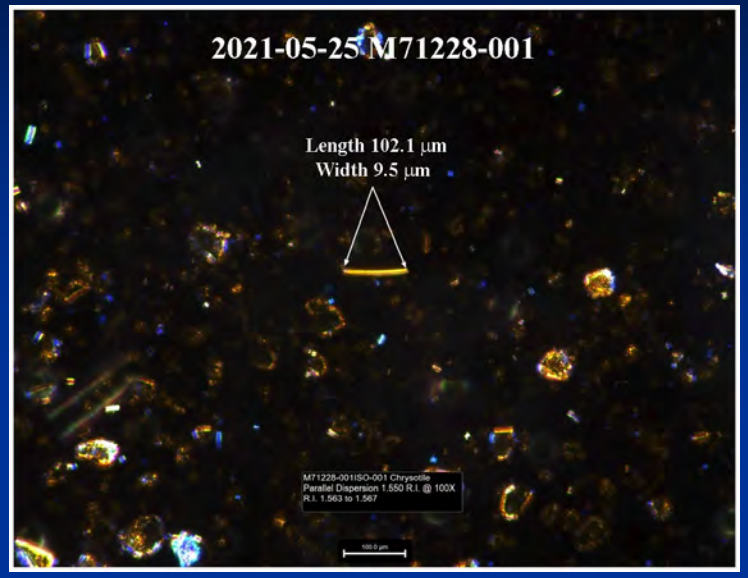
The above equation can be used to calculate the Confidence Level for known sample size, population proportion, and maximum allowed error. The Confidence Level of 2023-02-28 Valadez Bottle Report is far below 50%, making the False Positive error rate much greater than 50%. Such a False Positive error rate is totally unacceptable. A responsible laboratory will never adopt such a sampling scheme to make the False Positive error rate greater than 50%.

Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

Internally Conflicting Quantification Results.

Internally Conflicting Quantification Results

2021-05-25 OTShelf JBP Purchased Argentina (M71228-001)



Date of Report	2021-05-25
MAS No.	71228-001
Product	Argentina
Chrysotile %	0.005 - 0.006
Chrysotile Bundles per gram of baby powder	137000
Image of 71228-001 Chrysotile	p.39
Scale bar length (µm)	100
Length of Scale Bar on screen (pixel)	95.0
Chrysotile length on screen (pixel)	97.0
Chrysotile length (µm)	102.1
Chrysotile width on screen (pixel)	9.0
Chrysotile width (µm)	9.5
Chrysotile thickness (µm)	9.5
Single chrysotile volume (μm^3)	9164.02
Single chrysotile volume (mm^3)	0.0000091640
Total volume of chrysotile bundles (mm^3)	1.255470
Talc density (g/cm^3)	2.72
Volume of 1 gram chrysotile (cm^3)	0.368
Volume of 1 gram chrysotile (mm^3)	367.6
Percentage of chrysotile	0.34%

Table 2
Overall Summary of Off-The-Shelf JBP Container Sample Analysis Results

MAS Sample #	ISO-PLM w/o HLS Chrysotile %	Chrysotile Bundles Counted ISO	CSM/ISO-PLM with HLS chrysotile %	Chrysotile Bundles Counted CSM-ISO	Weight Recovery CSM-ISO	CSM/ISO-PLM with HLS chrysotile %
M71216-001	0.016-0.017	53	*0.022-0.023	70	24.2%	**0.005-0.006
M71216-002	0.009-0.012	33	0.014-0.015	48	21.4%	0.003
M71216-003	0.016-0.017	39	0.019-0.020	63	21.3%	0.004
	Range 0.009-0.017	Avg. 41 Bundles	Range 0.014-0.023	Avg. 60 Bundles	Avg. 22.3%	Range 0.003-0.006

*CSM chrysotile weight concentrations not weight corrected. **CSM chrysotile weight concentrations recovery corrected

Table 5
Summary of Estimated Chrysotile Bundles per gram Calculations for the JBP ISO & CSM PLM Results

MAS Sample #	ISO-PLM Wt of Sample Grams	No. of Chry Bundle counted	Chrysotile Bundles/g	Wt. of Sample in Grams	No. of Chry Bundles counted	Chrysotile Bundles/g
M71228 -001	0.0010	53	567,000	0.0010	70	749,000
M71228-002	0.0010	33	353,100	0.0010	48	514,000
M71228-003	0.0009	39	464,000	0.0011	63	613,000
	Avg. 0.0097	Avg. 42 Chry Bundles	Avg. 461,000	Avg. 0.00103	Avg. 60 chry Bundles	Avg. 625,000

MAS reported 137,000 chrysotile bundles constituting a 0.005 – 0.006%wt. asbestos concentration.

Reported: 0.005 – 0.006; Calculated: 0.34%. Differing by 62 times.

The conclusion is that MAS's quantification results are NOT credible.

Dr. Shu-Chun Su's Analysis of MAS's Analytical Results

Inaccurate and Unreliable Sample Preparation Procedure.

Incorrect Sample Preparation Procedure

2020 - 2024 HLS Resaults

Date	MAS No.			Light Fraction %
2020-09-17	M71666	001	1	17.0
			2	14.6
			3	13.4
2021-05-25	M71216	001	1	24.2
			2	21.4
			3	21.3
2023-02-28	M71614	001	1	15.9
2023-10-19	M71643	001	1	19.7
2024-02-15	M71740	001	1	25.7

Since MAS's chrysotile concentration is at the 0.00x% level, talc is then at 99+% level.
If the Heavy Liquid Separation (HLS) sample preparation procedure was correctly performed, the Light Fraction would be < 1%.
MAS's two-digit Light Fraction results clearly indicate that MAS was NOT capable of correctly performing the HLS sample preparation procedure.

Summary of Deficiencies of MAS's Analytical Procedures

- **Inability to ensure a 95% Confidence Level of quantification.**
- **Inability to correctly interpret dispersion staining colors.**
- **Inability to calibrate dispersion staining colors.**
- **Inability to understand the basic relationship between the material's refractive index and the refractive index of liquids used for measurement.**
- **Inability to conduct calibrated visual estimate (CVE).**
- **Inability to check the internal consistency of analytical data.**
- **Inability to correctly measure particle size under a polarized light microscope.**
- **Inability to correctly create scale bars.**
- **Inability to understand the fundamental physics principles governing the relationship between a material's refractive index and its physical dimension.**
- **Inability to understand the fundamental geological principles governing the formation of minerals and mineral ore deposits.**

References in Presentation

Aveston, J. (1969) The mechanical properties of asbestos. Journal of Materials Science, 4, 625-633.MAS (2020). https://doi.org/10.1007/BF00550118.

ISO 22262-1 ISO 22262-1

MAS (2020) 2020-03-18 MAS Rpt JBP-Titley.pdf

MAS (2020) 2020-03-20 MAS Rpt JBP-Doyle.pdf

MAS (2021) 2021-05-25 MAS OTShelf JBP Purchased Argentina (M71228).pdf

MAS (2021) 2021.09.05 - Dr. Longo Report Avon, Clinique, EL.pdf

MAS (2022) 2022-03-11 MAS Analy of Klayman's JBP & STS Containers (M71262).pdf

MAS (2023) 2023-02-28 - Valadez Bottle Report.pdf

MAS (2023) 2023.10.19 (M71643-001) Talcum Powder Analysis of Johnson's Baby Powder Compiled Notebook 14-2996.pdf

MAS (2024) 2024-02-15 M71740 Analysis of JBP (Rochelle Kirch) Compiled Notebook.pdf

MAS (2024) Kayme Clark (NJ) – William Longo Ph.D. Deposition-Vol. 1-20240327.

MAS (2024) Kayme Clark (NJ) – William Longo Ph.D. Deposition-Vol. 2-20240402.

Mumpion, F.A. and Thompson, C.S. (1973) Mineralogy And Origin of the Coalinga Asbestos Deposit. Clays and Clay Minerals. 23, 131 – 143.

Pier, J (2017) Wet Sieve Concentration Applied to Chrysotile in the Analysis of Talc for Asbestos. Johnson Conference, Burlington, VT.

Sprynskyy, M. et. al. (2011) Structural features of natural and acids modified chrysotile nanotubes. Journal of Physics and Chemistry of Solids. Volume 72, Issue 9. Pages 1015-1026. https://doi.org/10.1016/j.jpcs.2011.05.013.

Su, S.C. (2003) A rapid and accurate procedure for the determination of refractive indices of asbestos minerals. American Mineralogist, 88, 1979-1982.

Su, S.C (2022) The Dispersion Staining Technique and Its Application to Measuring Refractive Indices of Non-opaque Materials, with Emphasis on Asbestos Analysis, The Microscope, 69:2, pp 51–69; https://doi.org/10.59082/ZGWM6676.

Su, S.C. (2022) Area Percentage Charts to Aid Visual Estimation of Asbestos Concentration in Bulk Asbestos Samples, The Microscope 69:4, pp 160-162

Syed, S.F. et. al. (2020) Optimization of Tensile Strength and Shrinkage of Talc-Filled Polypropylene as a Packaging Material in Injection Molding. J Package Technol Res 4, 69–78. https://doi.org/10.1007/s41783-019-00077-6.

Shubhra, T.H. et. al. (2011) Mechanical properties of polypropylene composites: a review. J Thermoplast Compos. 26. 362-391. https://doi.org/10.1177/0892705711428659.

USP (2022) 41. USP-NF 〈1901〉 Theory and Practice of Asbestos Detection in Pharmaceutical Talc.pdf

Zhao, S. et. al. (2021) The Physical and Chemical Properties of Hemp Fiber Prepared by Alkaline Pectinase-Xylanase System. https://doi.org/10.21203/rs.3.rs-451112/v1.

Exhibit 73

SUPERIOR COURT OF NEW JERSEY
LAW DIVISION - MIDDLESEX COUNTY
DOCKET NO. MID-L-003809-18AS

KAYME A. CLARK and
DUSTIN W. CLARK,

Plaintiffs,

v.

JOHNSON & JOHNSON, et al.,

Defendants.

DEPOSITION UPON
ORAL EXAMINATION
OF
^

(VOLUME II)

TRANSCRIPT of the stenographic notes of ANDREA F. NOCKS, a Certified Court Reporter and Certified Realtime Court Reporter of the State of New Jersey, Certificate No. XI01573, taken at THE HELDRICH HOTEL, 10 Livingston Avenue, New Brunswick, New Jersey, on Thursday, July 18, 2024, commencing at ^ a.m., Eastern Standard Time.

APPEARANCES:
DEAN OMAR BRANHAM SHIRLEY LLP
BY: BENJAMIN BRALY, ESQ.
302 North Market Street
Suite 300
Dallas, Texas 75202
Attorneys for Plaintiffs

KING & SPALDING
BY: KEVIN HYNES, ESQ.
1185 Avenue of the Americas
34th Floor
New York, New York 10036
-AND-
McCARTER & ENGLISH
BY: JOHN C. GARDE, ESQ.
Four Gateway Center
100 Mulberry Street
Newark, New Jersey 07102
Attorneys for Defendant,
Johnson & Johnson

^

INDEX

EXHIBITS

NUMBER	DESCRIPTION	IDENTIFICATION
34		
35		
36		
37		
38		
39		
40		
41		

^ previously duly sworn
CONTINUED DIRECT EXAMINATION BY MR. BRALY:
Q. How are you?
A. I'm fine.
Q. Good to see you again.
A. Good to see you again.
Q. I said no, but it is actually kind of an important point. You understand that you are still under oath from the last time?
A. Understood.
Q. Great. So you're going to tell me the truth?
A. Yes.
Q. Good. 'Cause otherwise, we would have a real problem.
A. Sure.
Q. Have you conducted any additional analytical experimentation or evaluation of the issues pertaining to either the Clark case or the MDL case since our last deposition?
A. No.
Q. Okay. I want to talk to you a little bit about the Becke Line method of refractive index calculation. Okay?
A. Okay.

6

Q. It is a true statement that the dispersion staining method is a method to determine the refractive index of a particle, correct?
A. Is what method?
Q. That's a true statement, that it is a method?
A. One of the methods.
Q. Yes. There's another method that's called the Becke Line method for determining the refractive index of a particle, correct?
A. Correct.
Q. What I gathered from our last meeting was that you are taking the position that when you do dispersion staining, when you're looking at the colors under the polarizer, that you have to switch the objective to the Becke setting and evaluate where on the particle the Becke Line matches the refractive index fluid. Or most closely matches the refractive index fluid?
A. I should say it is not to find the Becke Line matches the color, it is to find out where is the true Becke Line and the dispersion staining color.
Q. Okay.
A. The dispersion staining color, they

7

are corresponding. Like you say, you have a series, a range of the color, dispersion staining color. Now, which one is the one we're presenting the true refract index, you would have to switch the Becke Line to examine the Becke Line characteristics to determine which color --
Q. Okay.
A. -- is present in the true refract index.
Q. So when you say you have to switch, you're talking about switching the setting in the objective, which is a piece of the microscope?
A. That's right.
Q. To remove what's called the central stop?
A. That's right.
Q. Right.
What you're describing is not the Becke Line method of determining the refractive index 'cause that's a completely separate methodology, right? It's using the Becke Line setting to help confirm the dispersion staining method?
A. No. So-called, the Becke Line setting, is in order to observe the Becke Line, like

8

the dispersion staining setting is for the observing the dispersion staining color. You see? The setting and the method, it's part of method, it's not just change the setting; it change the test method.
Q. So, when you perform this, when you switch the objective from central stop to the Becke setting, or the no-stop setting, I suppose is what it is --
A. Um-hum.
Q. -- are you saying that you're utilizing a completely separate method to confirm the other method?
A. That's right.
Q. I did a review of your entire report, the report that you issued in May, and the word "Becke" appears twice, and they're both in your article list, your list of references.
You would agree that nowhere in your report do you provide a criticism of Dr. Longo relative to some supposed failure to use the Becke Line method?
A. Could you say question again?
Q. Yes.
A. Please.

9

Q. Nowhere in your report do you discuss utilizing the Becke Line method to confirm or to critique the analysis that Dr. Longo performed in his dispersion staining analysis.
A. I don't have to, because he said he's a self-taught polarized light microscopy expert. Any expert should know that. It's, like, common knowledge. Yeah.
I only said his determination using the dispersion staining technique is incorrect.
Q. Where he takes the color based --
A. That's right. I don't have to point out where he's incorrect. Okay.
Q. No, no, no. I get it. You think he's wrong, you're saying that you don't have to point out exactly how he's wrong.
A. That's right.
Q. And of course, Dr. Longo is taking the position, I suppose, that the color at the edge, or the border of the fluid and the particles where you should be reviewing the coloring, you think that's wrong?
A. Now, you mention color. Let me make it clear, color does not identify mineral, does not identify any mineral, including asbestos mineral.

10

Color is not a intrinsic property.
Q. I understand.
A. Refract index is. You see, there's no literature, no methods, whether EPA, ISO or ASTM, they identify, describe, asbestos by color. Okay?
Q. But that's not what I asked you.
A. No, no, no. I want make -- because I --
Q. I want you to answer my question.
A. Yes. That's what I'm answering, the color question.
Q. You're not. I know the color corresponds to wavelength. I know this. That's not what I'm asking you.
A. What wavelengths?
Q. Yeah.
A. What wavelengths?
Q. That you can take the color and compare it to a chart that you've developed to determine a range of wavelengths --
A. What wavelengths, the question is. This a very central issue of this debate.
Q. I'm not debating with you.
A. No, no, no, no. A discussion, the central --

11

Q. Doctor, please. I'm just asking you questions.
A. Yes.
Q. I'd appreciate if you'd focus on the question I'm asking.
A. I am focusing on the question.
MR. HYNES: Let him finish the question.
BY MR. BRALY:
Q. Let's start over.
All I was trying to get at is that Dr. Longo evaluates the image at the border of where the fluid and the particle are coming together, at least that's what he said, and you disagree with that as a methodology for identifying what it is that he's looking at?
A. No, I'm not disagreeing with that. I said his methodology is wrong; he was not correctly performing the technique.
Q. Okay. One of the ways that he was not correctly performing the technique is because he didn't utilize this objective switch to the --
A. No, no, no. I never --
Q. Let me finish my question.
A. Okay. Sorry.

12

Q. One of the ways that you believe he was incorrect is because he didn't follow the methodology of switching to no-stop in evaluating where the Becke Line was?
A. No, I'm not saying that. I'm saying that -- I said he is incorrectly performing the dispersion staining technique; I didn't say he did not switch. Because it's not tutorial. I don't have to tell him what -- how to -- what's the correct way to performing the technique.
Q. I have a series of articles that you published that I want to talk to you about briefly.
A. Okay.
Q. Like before, let me get set up.
Exhibit 34 is going to be an article that you published in "American Mineralogist" in 2003 --
A. Yeah.
Q. -- called "Rapid and Accurate Procedure for the Determination of Refractive Indices of Regulated Asbestos Minerals."
I take it you're familiar with this?
A. Yes, that's my paper.
Q. Yes.
In this paper, you do not discuss

13

using Becke Lines or the Becke Line method to confirm what you're looking at by dispersion staining, correct?
A. I don't have to.
Q. Just answer my question.
A. Yes, I did not, because I don't have to. Okay.
Q. So, for an analyst or somebody reviewing the peer-reviewed literature, they would have no idea based on this paper from 2003 that you believe that you should confirm what they're seeing by dispersion staining by doing a Becke Line analysis?
MR. HYNES: Calls for speculation.
THE WITNESS: Can I answer the question?
MR. HYNES: Yeah, you can answer the question.
A. If a analyst using the dispersion staining technique to determine a refract index. If he is a trained analyst, he should know how do you need to distinguish the normal dispersion staining color from the distorted dispersion staining color. And he should know, in many cases he's trained, he should use the other method to distinguish that,

14

which Becke Line is the most effective method.
Q. Have you ever published that a dispersion staining analysis should be coupled with a Becke Line analysis in order to confirm what it is that's being looked at by dispersion staining?
A. No, I don't have to. Okay.
Q. You don't have to because you presume people should know if they're well trained and run a good lab?
A. Not well trained. If you are trained, you should know because Becke Line is the first technique to determine refract index. Dispersion staining technique came later in 1930s, okay, but Becke Line was developed way before that. Anyone who has a trained analyst using polarized light microscopy determine by refract index should know that, should know both technique and should know when do you use the technique to confirm each other.
Q. Okay. In your work for NVLAP, N-V-L-A-P -- your work for NVLAP, you accredited -- you personally accredited MAS as a PLM laboratory that performed PLM analysis in ways that were in accordance with standards?
A. No.

15

Q. You did not?
A. I did outside assessment. I don't have the power to accredit any laboratory. NVLAP, they have the power. I only report. My assessment is either determination whether they received accreditation or not. It was NVLAP; it's not me. I don't have that power.
Q. Exhibit 35 is a document dated September 9, 2016, titled at the top "NVLAP Onsite Assessment."
Do you see that?
A. Yeah.
Q. That's your signature on the bottom right?
A. Correct.
Q. What were you doing here?
A. I did the -- I follow the protocol, NVLAP protocol, to assess the managerial and technical management of the laboratory, which now for this one is MAS. I'm assessing whether they are capable to following, to comply with the managerial requirement and technical requirement set out by NVLAP. That's my job.
Q. And you were performing this analysis -- you were performing this analysis on

16

behalf of NVLAP?
A. Assessment.
Q. Right?
A. Yeah. Yes.
Q. I mean, you don't take this lightly, do you?
A. No.
Q. There is an error in this, the attached -- if you'll flip through them, it's missing, I think, pages 14, and I think another page. I have another exhibit that I can get for you.
A. Which, page 14?
Q. If you'll flip through it, there's 17 pages attached to it. You'll see --
A. No, the even page was missing. You want to print it --
Q. I'm saying I have the full thing. I am just marking -- here you go. (Handing.)
This will be Exhibit 36. It's the full list of the evaluation from NVLAP.
A. Yeah.
Q. Okay. So, in 2016 this is the evaluation that you conducted at MAS, correct?
A. Correct.

17

Q. And my colleague, Mr. Placitella, would tell me this is God's way of telling me I've been talking too much.
It includes -- again, back to Exhibit 36, it includes on page 2 a section on proficiency testing, correct?
A. Page 2, yeah, proficient test, yes. Yep.
Q. Actually, it was the other document I was pointing to.
A. Yes.
Q. And you conducted proficiency testing of MAS in 2016 specific to the way they were doing the PLM?
A. Let me make it clear: The proficient testing -- proficiency testing in the 3.4 clause is not what I did in the lab. That proficient testing is a formal testing issued by NVLAP twice a year, like M1 2015, M2 2016. This testing, you see the title --
Q. I wasn't asking you about that document. I wasn't asking you about that document.
MR. HYNES: Let him finish the answer, please.
A. But you you're asking the testing I

18

did.
Q. No, I didn't. I asked you on page 2, it lists requirements for --
A. Okay.
Q. Let's try to stick to the question I'm asking.
A. Okay.
Q. I said on page 2, it lists proficiency testing.
A. Correct.
Q. Okay. If we go to page 7 of Exhibit 36, page 7 of 17 --
A. Page 6?
Q. Seven.
A. Seven? Okay.
Q. Section 5.3 there's a section called "Accommodation and Environmental Conditions," correct?
A. Yes.
Q. And the Section 5.3.2 talks about "The laboratory shall have procedures for the use of blanks and asbestos-free material to determine the presence, quantity, and consistency of asbestos contamination in their analytical processes and have related procedures to control it."

19

Do you see that?
A. Yes, I do.
Q. And you evaluated this in 2016 as okay, correct?
A. Correct.
Q. Which means it passes?
A. Correct.
Q. For NVLAP certification?
A. Correct.
Q. And that's something you evaluated personally?
A. But not about accreditation. As I said, I only evaluate following this checklist. NVLAP has the power to determine whether they pass or not.
Q. This was the -- so when it says "okay" here, that was based on the information that you reported to NVLAP, correct?
A. Correct.
Q. Right.
And they said they passed?
A. What I'm saying, the "okay" here only means they are in -- complied with this requirement; NVLAP said whether they pass or not.
Q. Okay.

20

Go to the next page, page 8.
A. Okay.
Q. Test and calibration methods in method validation 5.4.1: "The laboratory shall use the US EPA interim method for the determination of asbestos in bulk insulation samples." That's found at 40 CFR Part 763.
Do you see that?
A. Yes, I do.
Q. Again, you performed this evaluation?
A. Yes, I did.
Q. And NVLAP okayed it, correct?
A. That's right. NVLAP okayed it.
Q. Based on the information you reported back to them?
A. Correct.
Q. Okay. Go to page 13 of 17.
A. 13?
Q. Yes.
A. Okay. 13.
Q. There's a section called "5.9"?
A. Correct.
Q. Assuring the quality of test and calibration methods.
Do you see that?

21

A. I see that.
Q. What does the letter C mean in this analysis?
A. Comments.
Q. Okay. Do you know where the comments are?
A. Yes. I said 5.9.1, I think they comply with this requirement from minimum 10 percent QA, and listed here QA rate. The QA rate by this lab meet -- meets this minimum 10 percent requirement. Comments in the NVLAP system, comment is not a nonconformity; it is only document the assessor's observation, okay? Yeah.
So comments is not criticism, what I'm saying is, just to show what the lab did is correct.
Q. So the comments are your actual comments from your review at MAS in 2016?
A. Yes.
Q. So, when we get to 5.9.5, which is found at page 14 of 17, Section -- I'm sorry.
A. 14, yes.
Q. 5.9.5.
A. Yep.
Q. The section is labeled "The

22

laboratory shall maintain and summarize all of the quality assurance activities at least monthly to include..." and then it includes the list of things to include, correct?
A. Correct.
Q. One of those is, under I, is the total qualitative error rate of the laboratory.
You see that?
A. Yes, I saw that.
Q. On the last page for comments, you marked "monthly summary well done"?
A. Yes.
Q. Okay. You were there specifically to determine MAS's compliance against a NVLAP checklist pertaining to their PLM methodology, the way they run their lab?
A. Correct.
Q. And NVLAP passed them, correct?
A. Correct.
Q. Based on the information you reviewed and provided to them and signed your name to?
A. More so based on the reviewer. The NVLAP procedure is such. They sent a assessor to the lab informing the lab how the assessor's biography. The lab get to determine whether they

23

accept this assessor or not. So, when they accept assessor, the assessor comes to the lab to do the assessment, then turning the assessment report like what I did.
However, there's one more step. The NVLAP will assign another assessor to review the report. If the review report is okay, then NVLAP determine whether they will grant the accreditation or not. So, it's based on not only my report, but a second step, that the reviewer's review.
Q. Okay. So somebody reviewed the information you provided?
A. Correct.
Q. And NVLAP approved MAS with regard to their PLM microscopy?
A. Correct.
Q. I want to turn back to the Becke Line discussion briefly.
A. Okay.
Q. If I understand it correctly, you agree that your report in no place discusses the application of a Becke Line methodology to dispersion staining analysis, but you believe that people should just know that if they're a quality PLM analyst?

24

A. Which report? You mean my MDL report?
Q. The only report you've issued in this case.
A. Okay. Yes.
Q. That's Exhibit 3 to this deposition.
A. Okay.
Q. In your published papers, and I could show you examples of this if you'd like, you refer to dispersion staining and a Becke Line analysis as two competing ways to determine the refractive index of a mineral, correct?
A. Incorrect.
Q. Okay.
A. I never said they are competing. Actually, they work in concert.
Q. I'm going to hand you an abstract from 2005 that you published.
A. Yes.
Q. And this will be Exhibit 37. Let me get this taken care of.
Are you familiar with this abstract?
A. Yes.
Q. What it says in the first paragraph is, "Although both Becke Line and dispersion

25

staining can be used to determine refractive index of a solid immersed in an immersion oil, dispersion staining has several advantages complementary to the Becke Line method that makes it a versatile alternative technique for refractive index determination using the immersion method," correct?
A. Correct.
Q. You're identifying dispersion staining as a completely separate technique for determining refractive indices, correct?
A. Correct. It's not me to decide, to determine what it is because, in fact, it is one of the method to determine refract index.
Q. So, going to Exhibit 13 -- do you have it in front of you?
A. Yes.
Q. Okay. Great.
So going to Exhibit 13, if you'll turn to -- it's paginated as page 53.
A. Okay.
Q. Yeah.
A. 53. Yes?
Q. And this is a 2022 article that you published, I believe in "The Microscope," correct?
A. Correct.

26

Q. At the top of page 53 you state, "There are three common techniques for assessing the sign and magnitude of the match/mismatch between a solid and its surrounding liquid: Becke Line, dispersion staining, and oblique illumination. Only the dispersion staining can meet the above specific needs for the routine PLM analysis of bulk asbestos samples in commercial environmental laboratories."
That's what you wrote in 2022, correct?
A. Correct.
Q. You do not write anywhere in this paper that the Becke Line method can confirm where an analyst should be looking on a particle to determine the reference to analyze, correct?
A. Correct.
Q. In fact, this paragraph is the only time Becke is mentioned in that -- in this entire document?
A. Correct.
Q. Last year, in 2023, you published an article entitled "The Unification of Becke Line and Dispersion Staining Techniques for the Determination of Refractive Index of Non-Opaque Materials," correct?

27

A. Correct.
Q. Do you remember when this was published in 2023?
A. I forgot which month.
Q. This will be Exhibit 38.
So, in this paper from 2023, if you'd turn to the third page, which is page 101 --
A. Yes.
Q. -- we see the three objective settings.
A. Correct.
Q. Central stop, annular stop, and then no -- no stop, or regular objective, correct?
A. Correct.
Q. This is the first published paper that I have seen from you that illustrates all three settings as opposed to just central stop and annular stop, correct?
A. Correct.
Q. If we continue in this paper to page 108 --
A. Yes.
Q. -- there is a series of images which compare the CSDS against a Becke Line image, correct?

28

A. Correct.
Q. This is the first time, that you're aware of, that this methodology has ever been published, correct?
MR. HYNES: Vague; overbroad.
A. No. I only says that's the first time Dr. Gunter take the picture.
Q. Are you aware of any other published literature saying that you should utilize the Becke Line method in conjunction with the dispersion staining method to determine the refractive index of a mineral?
A. I don't have to.
Q. So the answer is no?
A. No.
Q. Okay. Thank you.
A. No.
Q. If we continue to page 110, we see Figures 9 and Figures 11. Figure 11 is the three-mode dispersion staining, which I believe is the same thing that you brought with you on the first day of this deposition.
A. That's correct.
Q. Figure 9 are three separate images of what an analyst can find when conducting a Becke

29

Line analysis, correct?
A. That's right.
Q. And then if you'll turn to page 112, in the acknowledgments, you state, "The critical contributions from Professor Emeritus Mickey Gunter, University of Idaho, especially the superb suites of Becke Line and dispersion staining colors at various matching wavelengths that he meticulously obtained from a heating stage, have significantly improved this paper and are deeply appreciated.
"I would like to also express my thanks to Dr. Bryan Bandli at RJ Lee Group for his detailed and constructive review of this manuscript."
You see that?
A. Yes.
Q. I may be mistaken, but I thought last week when I deposed you, you had said that you didn't know Bryan Bandli except for a meeting in Chicago that had occurred some years previously.
MR. HYNES: Misstates prior testimony.
A. No, I think the first time I met him is in Chicago; I did not say I have never interact with him after that.

30

Q. Okay. This paper in 2023, you collaborated with Dr. Gunter who you've known for 40 years, and Bryan Bandli, correct?
A. No. I sent him for review.
Q. That's collaboration.
A. That's right.
Q. So the answer to my question is yes?
A. I didn't -- I don't know what you mean "collaboration" but --
Q. I'll rephrase it.
For this paper in 2023, you worked with Bryan Bandli and Mickey Gunter to publish this paper, correct?
A. I wrote the paper, then I sent him for review to get their feedback. That's it.
Q. Okay. Have you maintained a working relationship with Matt Sanchez after your initial meeting with him that you discussed last week?
A. I don't know how do you define a working relationship, but I did work with him. Okay.
Q. What else have you worked with Matt Sanchez on?
A. I think in June.
Q. The Pittsburgh project?

31

A. Correct.
Q. I'm not talking about the Pittsburgh project. Other than the Pittsburgh project, what else have you ever worked with Matt Sanchez on?
A. Never, I don't think so.
Q. Other than the Pittsburgh project and this paper in 2023, what else have you ever worked with Bryan Bandli on?
A. I think I sent him a paper about the dispersion staining color manuscript for him to review.
Q. Okay.
A. That's the only -- the other so-called working relationship.
Q. Have you had interaction with any of the other scientists or microscopists at the RJ Lee Group other than Mr. Sanchez -- Dr. Sanchez and Dr. Bandli?
A. Well, when we were working in the RJ Lee lab last June, like Monica, she was providing, like, logistic support for us.
Q. Okay. Other than for the Pittsburgh project, other than that, have you ever had any other interactions with other scientists who you knew to be affiliated with the RJ Lee Group?

32

A. No.
Q. Tell me about -- what is your view on Walter McCrone with regards to the proficiency of establishing standards applicable to polarized light microscopy?
A. He is a well-respected scientist.
Q. Did you know Dr. McCrone?
A. Yes, I know him.
Q. Do you rely on his work?
MR. HYNES: Overbroad.
A. What do you mean by "rely on his work"? I have never -- you see, the only thing I refer to his work is the 1967, the dispersion staining color chart. And that's the 1967 paper. And I don't remember which paper, I cite another reference from Dr. McCrone.
Q. You understand Dr. McCrone to be a well-respected imminent scientist in his field, at least until he passed away, correct?
A. Yes.
Q. I'm going to hand you a publication by Walter McCrone called "Asbestos Identification."
A. Yes, I know this.
Q. You know this?
A. Yeah.

33

Q. Okay. It's just an excerpt, but if you'd turn to the next page -- turn to the next page.
A. Okay.
Q. This is page 83 of this document.
You see in the second full paragraph --
By the way, did I mark this Exhibit 39? This will be Exhibit 39.
The second full paragraph states, "The matching wavelength is represented by color borders on the particle of interest."
Do you see that?
A. Yes.
Q. Okay. What Dr. McCrone says here is that the matching wavelength, which is a term that Dr. McCrone invented, correct?
A. No.
Q. No? Okay. I thought --
A. I said already, invented by a Russian microscopist called Cherkasov in 1930s.
Q. Okay.
A. Dr. McCrone referred to his paper.
Q. All right. I thought maybe you had published something differently, so I'll re-ask the

34

question.
"The matching wavelength" -- which is what it is that you're trying to identify in polarized light microscopy, correct?
A. Correct.
Q. -- "is represented by colored borders on the particle of interest."
That's what he wrote, correct?
A. Correct.
Q. Okay. Dr. McCrone did not write that you should utilize dispersion staining with a Becke Line analysis ever that you're aware of, correct?
A. Correct.
Q. All right. I'm changing topics now.
A. Okay.
Q. I'm going to ask you about Michel-Levy charts for just a moment, and then I think we can probably take a break. Okay?
A. Okay.
Q. All right. So, Michel-Levy charts are a method for determining the birefringence of a particle, correct?
A. Correct.
Q. It's not the only method, but it is a method, correct?

35

A. Yes, one of the method.
Q. I'm going to have to put this one on the screen. I think but this will be Exhibit 40. And it is just a -- I broke the computer. Make this bigger.
Exhibit 40 is an example of a Michel-Levy color chart, correct?
A. Correct.
Q. So birefringence is determined by the relative refractive indices in the gamma and alpha directions, correct?
A. Correct.
Q. Okay.
A. But, it was not used by Michel-Levy chart. Michel-Levy chart never used that.
Q. No, I understand. The Michel-Levy charts don't calculate birefringence that way because it's a reference chart. You reference a viewed color and you compare it to the chart given other parameters, correct?
A. There's a two way to determine birefringence: One is Michel-Levy chart, another is by determine the absolute refract index of gamma and alpha. This is two separate methods.
Q. I very much understand that. Okay.

36

A. Yeah.
Q. What I'm saying is, scientifically, birefringence is determined by the refractive index of the particle that you're analyzing, correct?
A. It was determined, but it's not principle of Michel-Levy chart. I have to make very clear about that.
Q. We're missing each other entirely.
A. Okay.
Q. All right? Birefringence is a reflexion of what the refractive index of the measured particle is, just conceptually, right?
A. Correct.
Q. In the Michel-Levy charts, on the left-hand X axis, I guess it is, it's a vertical axis, right, the X axis? I always mess that up. But on the left-hand side, the Michel-Levy charts lists different values depending on the thickness of the particle?
A. Correct.
Q. Is this indicative of the proposition that various thicknesses of a particle can distort light at different rates and, therefore, have different refractive indices?
A. No, not at all. You know the history

37

of this chart was developed by petrologist. At that time, at early age, people don't measure birefringence by locating particle because when you examine the petrographic thick section, the standout thickness is 30 micron. So it's a uniform thickness on glass slide.
Where you try to identify a rock, what type of rock, was it volcanic or sedimentary, you always cut a rock into 30-micron thick slices; therefore, you see this 30 is in the middle, not the standard thickness, to determine birefringence using the Michel-Levy chart.
The chart has other thickness. It doesn't mean it would change the refract index, the thickness related to the birefringence. The thicker the thickness, the higher the birefringence.
Q. Okay.
A. Another important issue is --
Q. Go ahead. I'll leave that up.
A. Here it says, like in the down indicate .0.05. That's the birefringence. It could be the mineral 1.65 gamma, alpha 1.60.
Q. Um-hum.
A. It could be another mineral. It's alpha is 1.50, but its gamma is 1.55. So, this

38

chart is unrelated to the gamma and the alpha.
Q. Okay. Because that's a separate method of calculating --
A. That's right.
Q. -- birefringence?
Doctor, you have to let me finish my question.
A. Okay. Sorry.
Q. You can continue.
A. So this chart was developed specifically for the petrologist looking for the thin section. It's not for the particle identification because you don't know the accurate particle thickness.
Q. Okay. So, let's talk about thicknesses and refractive indexes for a minute.
A. Um-hum.
Q. You've seen that I use reading glasses. Reading glasses distort the light going to your eyes, correct?
A. That's right.
Q. They have a refractive index?
A. Correct.
Q. The glass in your reading glasses has a refractive index?

39

A. Correct.
Q. If I make that glass thicker, it will distort the light more, correct?
A. Depending the refract index of the glass.
Q. Right.
A. If the refract index is the same, no, the reflection angle is the same.
Q. Right.
A. It does not change the refract index of the glass.
Q. When you change a prescription in your glasses, you are changing the refractive index of what is being fed to your light -- to your eyes through the glasses, correct?
A. No, no, no. The "prescript" lens is the curvature at the angle of incident and refracted. So the thickness, if the same material, same glass, whether it's glass, or later which people use polycarbonate, the plastic, okay, and the plastic has a high refractive index; therefore, make the lens thinner, which is good for the wearer.
Q. Okay. If you have a mineral that is bundled, where there's multiple individuals of that minerals stacked on top of each other.

40

A. Yes.
Q. And each of them have the same refractive index. Okay? You with me so far?
A. Yes.
Q. Would the bundle not distort the light more than a thinner section of that same bundle?
A. Yes.
Q. Okay. Isn't the refractive index a measurement of the degree to which light is distorted through the particle? Isn't that what it is?
A. No.
Q. No?
A. "Distorted" is not a "terminolog" in this science; reflection is. So, the light is refracted by the fiber or the individual component of a fiber bundle; therefore, it is a fact by the interface between the fibers because the interface angle would affect the reflection. If happen, the interface incident angle to interface is at the critical angle, or exceeding the critical angle, that wavelength will be internally totally refracted out of the microscope.
So, it's like, for example, the blue

41

light has 86.5 degree of critical angle for the 1.55 oil and the typical 1866 chrysotile, okay? For the red light is 83.5 degree. Whenever it interface, the angle with the incident light is at the critical angle; for example, for the blue wavelength, which are 86.5 degree, if I remember correctly, then that blue wavelength will be totally refracted. Okay?
Q. A fiber of a given refractive index will distort light differently than a bundle of those same fibers even if those same fibers all have the same refractive index, direct?
MR. HYNES: Incomplete hypothetical.
A. Yes and no. It doesn't matter it's a fiber bundle or single fiber. Even if single fiber. The best example is the glass. See, in order to meet NVLAP requirement for asbestos lab, I develop a method to calibrate the oil, use the Cargille glass standards. The glass are single particles, however, the edge, sometime they're very steep, very sharp; therefore, a single particle will show distorted dispersion staining color. That's why my method has been widely used by asbestos labs.
So when I go to the lab, they ask me: How come this glass is supposed to be uniform refract index, for example, calibrate 1.550 is

42

immersion oil, use it at 1.55 glass? They're supposed to match very well. However, how come I saw a range of dispersion staining color? Like one of the picture I took in Pittsburgh.

Now explain to them: Well, it is the total reflection. If a single particle, if the interface -- for example, what I'm saying is, like, this steep, the incident light coming from the light source, if the angle is exceeding 86 or 87 degree, then the blue wavelength will be totally reflected.

In that case, the dispersion staining color was distorted because some component of the wavelengths is missing due to the total reflection; therefore, it doesn't matter it's a single fiber or fiber bundle. It's all determined by the "morpholog," by the interface angle.

MR. BRALY: Should we take a break now?

MR. HYNES: Sure.

(Recess: 10:11 a.m. to 10:18 a.m., Eastern Standard Time.)

BY MR. BRALY:

Q. Dr. Su?

A. Okay.

Q. One of the myriad complaints you have

43

with Dr. Longo's PLM testing has to do with the size of the particles and their conformity with each other.

You follow what I'm saying?

A. Yes, I did.

Q. And I guess the top-line criticism here is that if it were truly chrysotile that he's finding in these samples, that the chrysotile itself would not match the size of the talc particles in the samples?

A. Yes, that was my opinion.

Q. Okay. And that is based on a milled sample of -- this is a milled sample of 1886 -- or 1866 SRM chrysotile, correct?

A. Yes and no, because I examine the Calidria chrysotile-spiked sample.

Q. Um-hum.

A. Okay.

Q. Okay. So it's --

A. It's consistent. Okay. Whether it is 1866 or Calidria, the particle size is not as small as the talc.

Q. You would agree that there are certain advantages that transmission electron microscopy can provide over TEM, such as a spectra

44

of the chemical composition in the crystal structure of the mineral you're looking at; true?

A. Yes. The TEM method can determine the elemental composition of a object by EDX technique.

Q. So you could have assurances that what it is that you're looking at is the same as the chemical composition of what it is you believe it is that you're looking at, right?

A. Correct.

Q. Your report seems to suggest that the fiber lengths associated with chrysotile will be much longer, on the order of, oh, in some cases, 30, 40, 50 more microns in length, correct?

A. Correct.

Q. Are you aware that MAS has conducted a TEM analysis of Calidria and found that that's not correct?

A. I'm not aware, because --

Q. I'm handing you what's marked as Exhibit 41.

I have a copy for you, Kevin. If you can hand that down to Mr. Hynes.

Exhibit 41 is an October 5, 2023, TEM analysis of length dispersions of sample Calidria.

45

A. Yes, I look at the report.

Q. You're seeing a lot of lengths reported here that fall under 10 microns in length, correct?

A. Correct.

Q. That's inconsistent with what you reported in your PowerPoint, correct?

A. Also inconsistent with the work I did in Pittsburgh. I took SEM picture, those structure, the SG210 of the SEM, which is equally accurate for the length determination. They are much larger than the report by MAS.

Q. Okay. Well this is page 4 of Exhibit 41, if you look at the monitor. You could do it on your page, too, if you wish. But it's the first TEM photomicrograph here. We see a bundle of what's reported as RG210 -- there is no RG210, so it's probably a typo. SG210.

-- top 001 chrysotile reported length of 2.7 microns.

Do you see that?

A. Yes, I saw that.

Q. That's inconsistent with what you found in your Pittsburgh project with Mr. Sanchez and Mr. Bandli, correct?

46

MR. HYNES: Form.
A. Correct.
Q. If we scroll ahead, it's page 12 of the PDF but it's the next image here, and this is reported as Calidria RG144, which is a different grade than SG210.
You see that?
A. I saw that.
Q. Which is a -- you would agree this is a bundle of chrysotile fibers, right, presuming the EDXA all matches in the chrysotile spectrum would match, that this is visually a bundle of fibers, correct?
A. I don't know how accurate this image is. I would love to look at fiber myself.
Q. Okay. But this is reporting RG144 as a length of 2.1 microns, correct?
A. Correct.
Q. Which is inconsistent with what you found by polarized light with Matt Sanchez, correct?
A. By the way, you said is 2.1 micron. Where is the scale bar? Without scale bar, I cannot say it is 2.1 micron.
Q. You don't trust the software utilized with TEM to --

47

A. No. The TEM -- no, I'm not say I'm not trusting it, but I have to look at the scale bar.
Q. Sure. Sounds like you're saying you're not trusting it.
A. And also, one issue here is if you look at that, the width is .1.
Q. Sure.
A. The length at 2.1.
Q. Um-hum.
A. You said the length 21 times than the width.
Q. Sure.
A. Does that look to you like 21 times?
Q. Yes, it does.
A. I can measure off the screen --
Q. I think anyone with a set of eyes can see that's about 21 times the length.
A. Doesn't look that to me.
Q. Okay.
A. Okay. I think the ratio, the aspect ratio, is larger than 21.
Q. Okay.
A. Um-hum.
Q. All right. Take it up with the

48

manufacturers of the software, I suppose, but...
A. And didn't even say what magnification on this -- the TEM --
Q. Do you remember the question I asked you?
A. Yeah.
Q. The question I was asking you was 2.1 microns in length would be inconsistent with what you found with Dr. Sanchez, correct?
MR. HYNES: Form.
A. What I'm saying is --
Q. Just answer my question, please.
A. I'm answering.
Q. Thank you.
Is the answer, yes, it's inconsistent with what you found with Dr. Sanchez --
MR. HYNES: Form.
A. Or their data is not consistent with Dr. Sanchez.
Q. Very good.
A. It's not Dr. Sanchez inconsistent with him, MAS. Okay.
Q. On page 28 of the PDF, we see another image. This is reported as Calidria RG210 again. I believe that's a typo because I don't think there

49

was ever an RG210. But it's reported as the middle.
This is 002 chrysotile reported as 1.7 microns by .18 microns.
Do you see that?
A. I saw that.
Q. You agree visually that would be a bundle, correct?
A. Yes.
Q. Okay. So, as far as size distribution goes, you and Dr. Sanchez and Dr. Bandli did not find sizes of Calidria that were in the size range of what I just showed you, correct?
A. Incorrect. We found similar size, but we found size much bigger than that.
Q. Okay.
A. Also, at a time USP study, that is the best particle size distribution of the spiked chrysotile versus talc. Actually, you cannot use a single, or several images to show the particle size distribution. They plotted the two curves. The peak of talc is smaller than the peak of chrysotile.
Q. Okay.
A. That is the true particle size distribution.

50

Q. Listen, if I want you to talk about the USP study, I'll ask you about the USP study. Okay?
A. Yeah.
Q. So, just so I understand this correctly, you did find Calidria samples in what you evaluated that were under 10 microns in length, correct?
A. Yes.
Q. The USP particle size study that you're referencing, this was primarily undertaken by Dr. Sanchez, correct?
A. I don't know. I really don't know. I don't know who perform, but I know one of the probably investigator is Julie Pier, okay? I have never communicate with Dr. Sanchez about USP study.
Q. You don't know if Dr. Sanchez was involved in the USP study?
A. No, not at all. I know Julie Pier is.
Q. Do you know what Julie Pier's role has been relative to talc manufacturing interests?
A. No.
Q. You don't?
A. Oh, I know she used to work for

51

like --
Q. Imerys?
A. Yes. Correct.
Q. Right.
A. Yeah.
Q. I want to ask you about a particular slide in your PowerPoint. And this is page 45 of Exhibit 3, but it's page 25 of your PowerPoint. Okay?
A. Okay.
Q. You've entitled this slide "MAS's Inability to Create Scale Bars."
You see that?
A. Yes, I did.
Q. And you've taken the selected image for both of these photographs and extrapolated out that that image represents the entire field of view available to the microscopist, correct?
A. Correct.
Q. Again, you're unaware of whether or not the software utilized by MAS allows the analyst to take a screen capture of just the area they're focused on as opposed to the entire field of view, correct?
A. Yes and no. First, it doesn't matter

52

you crop image or not. You see the top particle on this two images, they are similar. That is impossible, which means the field of view scale is incorrect.
Q. You said that the size of the particle is -- you understand that these are different particles in each of these photographs, right?
A. They are different samples, but they are talc. There's no difference between the particle, the identity of particle.
Q. Fine. But you said that based on the size of the image that's presented here -- first of all, you don't know what the field of view for either of these images was, correct?
A. I know because I measure the --
Q. Image?
A. -- image.
Q. But the image was cropped. You don't know what the total field of view was that the microscopist was looking at, do you?
A. However --
Q. No, just answer my question first, then do your "however."
A. Okay.

53

Q. Answer my question.
A. No.
Q. Okay. Now you could do your "however."
A. Yes. They mark the particle size.
Q. Right.
A. Which is indicative, at least the current field of view. This two field of view based on their own data, not my data. For example, the first one, the width of the particle was marked 46.7 micron, micrometer; therefore, you can calculate the field of view whether it's cropped or not. So this 814 is based on the MAS data.
Q. It's based on a visualization based on the size of the cropped image that you were given to look at.
A. You don't know it's cropped. Do you know?
Q. You don't know either.
A. That's right.
Q. But what I'm saying -- I do know, actually, but you don't know. But you're basing that 814 on a visual extrapolation of what was reported as 46.7 taken over the width of the image that was provided to you, correct?

54

A. Correct.
Q. You don't know if that was the whole field of view?
A. I don't have to.
Q. But you don't.
A. I don't.
Q. Thank you.
The same is true for the bottom photo. You have a scale bar there, and you utilize that scale bar across the width of the image that was given to you, but you don't know if that was the entire field of view that the analyst was looking at, correct?
A. Correct.
Q. Thank you.
A. However --
Q. Go ahead. You're entitled to do your "howevers."
A. I was not based on my evaluation simply by looking at the scale bar or the particle size marked by MAS. I also base my observation, my opinion, on the size of the talc particle in both image. If those two field of view is so much different, how could the talc particle there look similar?

55

See, that's another criteria you can tell whether the image was cropped at the same rate. So, this thing were indicate whether it's a full field of view or a cropped field of view. The particles look the same, which means they are either full field of view or cropped at the same rate. That is my conclusion.
Again, here is -- the FOV, I'm talking about image field of view. You see? The image have a field of view. It doesn't matter the image had been cropped or not.
Q. Those two images that you utilized there are different images taken from different reports, correct?
A. Yeah. Yes. One is 71095, 71940.
Q. They were taken from different particles. Regardless of what you think the particle is, they're not the same particle, correct?
A. They are. They're both -- the title of the report is the baby powder.
Q. The specific particle being viewed is not the same particle in both photographs?
A. They are different baby powder bottle.
Q. I want to ask you about -- I'm going

56

to put this on the screen here. This is Exhibit 3 of your -- this is Exhibit 3. This is page 11 of your report. Okay? You have this paragraph at the bottom of page 11.
You state, "As shown in the table above, from 2020 to 2024, over a five-year span using various different sample preparation techniques as described in MAS's expert reports, the heavy liquid separation sample preparation procedure produces a series of extremely inconsistent light fractions ranging from 13.4 percent to 24.2 percent in talcum powder products, which further produced chrysotile concentrations ranging from .003 percent to .01 percent.
"For baby powder samples consisting of 99.9 percent talcum powder, which should be in the heavy fraction, how is it possible that the light fraction more than 1 percent?"
You see that?
A. I see that.
Q. Who in the world told you that baby powder was 99.9 percent talcum powder? Who told you that?
A. The report told me.
Q. You know that baby powder has never

57

been 99.9 percent talc.
A. Well, if the chrysotile concentration reported here is point -- less than .01, and they did not identify any other phases component in the baby powder, now, what else could be?
Q. Your criticism is based on the idea that Johnson's Baby Powder was 99.9 percent talc?
A. No, I was based on the MAS report.
Q. Okay.
A. Because they did not indicate the other phases in this baby powder; therefore, you minus the chrysotile concentration, you end up 99.
Q. Have you ever prepared a heavy liquid separation sample?
A. I did.
Q. When?
A. When I was working for Hercules for certain project.
Q. Did you do this one time or was this a routine part of your job?
A. Actually, more than one time.
Q. Two times, or is this something -- like something you did thousands --
A. Oh, much more than that. In my 20-years career in Hercules, we did so many project.

58

Some project involved the heavy liquid separation.
Q. Have you ever done heavy liquid separation for the purposes of evaluating minerals in talc?
A. No.
Q. So, your statement here is that "For baby powder samples consisting of 99.9 percent talcum powder, which should be in the heavy fraction, how is it possible for the light fraction more than 1 percent? It is beyond comprehension that these ridiculous two-digit light fraction results did not make MAS realize that something was grossly wrong with each and every sample preparation that it tried over the course of five years."
Do you see that?
A. I saw that.
Q. So, for this to really be ridiculous, you would have to conclude -- or you have to start from the position that the baby powder was, indeed, 99.9 percent talc, right?
MR. HYNES: Misstates testimony.
A. No. I said this report did not report a third phase in the baby powder --
Q. Are you saying p-h-a -- I'm sorry. Are you "phase" like p-h-a-s-e?

59

A. Yeah.
Q. Continue, please.
A. -- component. A third component in the product, now which only identify the chrysotile and talc.
If the report said there is a third or fourth components in the sample, then the 99 conclusion was incorrect; however, it says the only other components in this sample is chrysotile, therefore, what else could be?
Q. Okay.
A. Also, they never said in the light fraction besides chrysotile, there's other things than talc.
Q. Okay. Have you ever asked Matt Sanchez about how much talc there is in baby powder?
A. No.
Q. Ever read any Johnson & Johnson documents to determine how much talc they have in baby powder?
A. No.
Q. Are you aware of industry documents that indicate that for something to be a consumer talc product, it only has to have at least 90 percent talc in it? Are you aware of this?

60

A. No, I'm not.
Q. Okay. So because MAS didn't report the amount of nickel or carbonates or whatever else might be present, you took that to mean that it was chrysotile and talc and nothing else?
A. That's right.
Q. Okay. Let me ask you about -- let me get this off. Actually, no, I'm going to leave this up there. I'm going to take away the highlight. I like your cars picture, by the way.
There is a section of your report, this is page 92 of Exhibit 3 which is page 72 of your PowerPoint.
A. I saw that.
Q. All right. You want to take a second to go there?
A. Yes. I'm on this page.
Q. So, I just have some questions about this formula. This formula is N, meaning the sample size that is large enough to attain the specified maximum allowable error in confidence level is equal to -- and I could read this out but it's not going to make any sense in the record. But regardless, anyone who's following along with Exhibit 3 at page 72 of the PowerPoint can find the same formula.

61

For N, what is the sample size that you're using when you conduct this analysis? Is it the slide, is it the --
A. The total amount of the sample to be analyzed.
Q. So, total amount of material under the slide?
A. Not -- if they put all the amount of the sample on the slides, it is. What I am saying, if the .000017 gram sample they took out from the bottle, if they spread all sample onto slide, yes, they are analyzing that amount.
Q. Okay. Is this corrected for, like, the weight of the cover slip and everything else, or is this -- I mean, does that make sense you would do that? Never mind, that's a dumb question. Don't answer my dumb questions.
Then -- is this reported in, then, a percentage by weight or does this end up being reported as total grams or...
A. Actually, if you look at the report, the report said they sampled that amount of the sample for this analysis.
Q. Have you ever seen a calculation like this performed on something relative to PLM

62

microscopy of particles like we're talking about?
A. I can only said when I was working at research center of Hercules, when we received some project, that's the first thing we do: How much sample we should analyze to reach the 95 perfect confidence level. This is the basic procedure of the determine a component system. Okay.
Q. Did you perform this calculation every -- first of all, have you performed this calculation relative to your opinions in this case?
A. I performed this calculation using MAS standard.
Q. Okay.
A. Which showed in slide -- yes, I did, although I did not put on this PowerPoint because the number is too large. What I am saying is, if you plug this .000017 into this equation and you require -- actually, I'm very -- what I'm saying, I allow them probably maximum allowed error, probably 5 percent, 10 percent. Anybody can do the calculation and turn out the confidence level is so small, it just should not be used.
Q. So what I -- I want to start with a couple of do you agrees with me, and then we're going to go on to the question I'm really asking

63

you. Okay?
A. Okay.
Q. You agree with me that nowhere in your report do you actually show the variable values that you use in performing the calculation that you're talking about?
A. I did not document that.
Q. Thank you.
You can provide that, correct?
A. Correct.
Q. You report that your calculation ended up far below 50 percent?
A. Correct.
Q. That's at the bottom of page 73 of your slide slow.
Are you able to tell me what values you used for variables in this formula, meaning the value for N, the value for P, and so forth and so on, and if not, can you provide that data to us?
A. Of course I can.
Q. Are you able to recall it now, the values that you used for --
A. No, I cannot recall from my head.
Q. Okay. Clearly we're going to make a request for that data. As long as that can be

64

provided to us before you testify again, I think we'll be okay. I'm not trying to make a big deal out of this.
In fact, let's go ahead and take five. I am maybe close to being done here.
(Recess: 10:54 a.m. to 11:04 a.m., Eastern Standard Time.)
BY MR. BRALY:
Q. Dr. Su, I had a question about the materials that you produced after you had authored your report from the Pittsburgh project. There is a folder in what you produced called "SEM Images - Thermo Apereo," A-p-e-r-e-o?
A. Yes.
Q. And in that there are a series of images. And I'm just going to do a couple of these. The first one that I'm going to show you is marked as Exhibit 42. This is one of the images --
A. Yes.
Q. -- that you produced.
What is this?
A. This is a talc -- I will have to look at the --
MR. HYNES: Could you just read off the file name?

65

MR. BRALY: Yeah. The file name is "Wet-Sieved" -- is it "sieved" or "sieved"?
A. Sieve.
Q. "Wet-Sieved Talc SG210 1,000 SE_ETD."
A. Yeah, that is SG210 spiked talc sample.
Q. What does "wet-sieved" mean? What did you do to the sample? ^
A. The wet sieve is using the powder, they put in the water and then sieve it, because the water make it easier for the particle to pass through the holes of the sieve. Okay? That is more efficient than dry sieve. Okay? The dry sieve use vibration device to shake the sieves so that the particle was falling through the holes, but the wet sieve is much more efficient to see the kind of fine powder samples.
So they wet the sample, put a water solution, and sieve it. Then this portion was retained by the 400 mesh sieve. They collect that from a service, then try to take SEM picture.
Q. So, this other image, which will be Exhibit 43. The file name on this is "Wet-Sieved Talc SG 210_6500_SE_ETD."
A. Let me explain the file name.

66

Q. No. Well, sure, go ahead. Tell us what the file name.
A. 6500 magnification. Okay.
Q. All right.
A. "SE" is secondary electron image. Okay?
Q. So, we can apply that structure to all of the file names in that folder?
A. That's right.
Q. Okay. Great. Thank you. That actually helps a lot.
So what we're looking at here is SG210 with what, little bits of talc stuck in it?
A. I think so.
Q. Is this part of what -- I'm sorry. Is this part of what you used to determine the part of your report discussing the role of fiber lengths and particle lengths?
A. Correct.
Q. Have you prepared any kind of a report or summation discussing your opinions relative to the data you produced as a result of the Pittsburgh meeting in June of this year?
A. You mean prepare what report?
Q. That's what I'm asking you. Have you

67

prepared a report or a summation of your opinions relative to the data you produced in June specific to the Pittsburgh project?
A. Nobody ask me. Okay.
Q. So you have not?
A. No.
MR. BRALY: Chris, are you good to go here?
MR. PLACITELLA: You're ready for me?
MR. BRALY: I believe so.
MR. PLACITELLA: Okay. Well, why don't we take a five-minute break then, and I'll get my stuff together.
MR. BRALY: Okay. The one document that you asked me to print, I'm going to go ahead, and that will be the next exhibit in line, which is Exhibit 44. Okay.
MR. PLACITELLA: Okay.
MR. BRALY: All right. I will pass the witness at this time and let Mr. Placitella ask some questions.
(Recess: 11:10 a.m. to 11:11 a.m., Eastern Standard Time.)
CROSS-EXAMINATION MR. PLACITELLA: ^
Q. I wish I could be there with you this

68

morning, Dr. Su. How are you today?
A. I'm fine. Thank you.
Q. Thanks for taking the time here.
In preparing your report related to Dr. Longo, were you able to use the photos he supplied and make -- and provide opinions concerning those photos?
A. Yes.
Q. Okay. And were you able to take the data that he supplied and provide opinions related to that data?
A. Correct.
Q. And despite whatever shortcomings you indicated earlier on, you were able to take the opinions and the data supplied and provide opinions in this case, correct?
A. Correct.
Q. All right. And your opinions differ from Dr. Longo, correct?
A. Correct.
Q. Okay. And you were able to provide your opinions despite any issues you had with the lighting, correct?
A. Yes. I mention the lighting is a factor affecting the dispersion staining color.

69

Q. Okay. But you were still -- despite your issues with the lighting, you were still able to provide an opinion based upon the method and data that Dr. Longo used, correct?
A. Correct. All my image or data is from MAS reports.
Q. Okay. And despite the testimony you gave about brightness concerning the photo, the data that was generated by Dr. Longo's lab enabled you to provide an independent opinion in this case, correct?
A. Correct.
Q. Okay. Now, in this case, the first day I counted you mentioned "Becke Line" about 79 times. And after you went to Middlesex County and witnessed Dr. Longo's testimony, is that when you went to Pittsburgh?
A. Yeah, I went Pittsburgh after that.
Q. Okay. And you did -- and you said that one of the definitive tests to perform was the Becke Line analysis, correct?
A. Can you say again?
Q. One of the definitive tests that you use was the Becke Line test, correct?
A. Correct.

70

Q. How long did it take you to do that --
A. It's very quick. You just --
Q. -- when you were in Pittsburgh?
A. Yes. Okay. It's very quick. You just switch to a non-central stop dispersion mode.
Q. Okay. When you were with Dr. Sanchez in Pittsburgh, how long were you there?
A. We were there for two and a half days.
Q. Okay. And the actual -- two and a half days, and the actual testing that you did, how long did that take?
A. Oh, I should correct. We were there -- we arrived the day before. I mean, we worked for two and a half days.
Q. So you were there three and a half days together?
A. Yeah. I arrived there the day before, I leave the third day. That's why it's half day. I leave in the afternoon.
Q. And in front of the microscope, how much time did you spend when you were in Pittsburgh?
A. I think the first day probably nine or ten hour. The second day is pretty similar to

71

that. The third day, the half day is, I think, in the morning, and one hour in the afternoon. Or one hour in the --
Q. So --
A. Half afternoon, because I left at 3 p.m. to the airport.
Q. Okay. So you spent about 15 to 20 hours under the microscope?
A. I think I spent probably 26 or 27 hours in doing the analysis.
Q. Okay. So you spent 26 or 27 hours doing the analysis. And of the 26 or 27 hours, was it -- how much time of that 26 or 27 hours did you use to do the Becke Line analysis?
A. I did not count the time. Every time I look at dispersion staining color, I turn the objective lens to switch that to Becke Line mode. That is the --
Q. What's your best estimate of the amount of time you spent in the Becke Line mode of the 27 hours?
A. Probably equal to the amount time observing the central stop dispersion staining color.
Q. Okay. And how much did you charge

72

for that work, those three days?
A. Just the hours I've been working.
Q. Right. Do you have any idea what you billed them for?
A. Like, I don't remember exact number, but it was calculate by the travel time plus the actual time working in the lab.
Q. And did you record everything you did?
A. Yes.
Q. And after you did that, you never supplemented your MDL report, correct?
A. No.
Q. Now, whose idea was it to videotape what you were doing?
A. My idea.
Q. Okay. And am I correct that none of the work that you did in Pittsburgh involved heavy liquid separation?
A. No.
Q. So I'm correct. None of it did, correct?
A. Correct.
Q. Okay. You also at some point monitored Dr. Hess's -- Mr. Hess's deposition,

73

correct?
A. Correct.
Q. All right. Did you help counsel prepare for that deposition?
A. No.
Q. Did you read the transcript after the deposition?
A. I read part of them so far; not the whole transcripts.
Q. What was your role -- or what did you understand your role to be to when monitoring the deposition?
MR. HYNES: Vague.
A. I want to know how he analyzes samples. How he did, because he is the -- he is the one who perform the analysis. I want to know the detail of his analytical procedure and technique.
Q. Okay. But you were able to prepare your 100-page MDL report without knowing that, correct?
A. Correct.
Q. Did Mr. Hess testify to anything that you disagreed with?
A. Yes.
Q. And what was that?

74

A. If I can recall from the report I read, the first issue is he said for negative elongation mineral, the gamma is less than alpha, which is totally incorrect.

Also, the second issue so far after I read the transcript is, he said he did not calibrate the dispersion staining color by himself; somebody else did that. That is also wrong. Because if you are the analyst, you will have to calibrate your eyes to the dispersion staining color displayed in the equipment you used to perform analysis.

So far, those are two issues I found which is wrong.

Q. Anything else?

A. Not yet. I have not read the whole transcript yet.

Q. But you were there. What do you recall that you disagreed with? What else?

A. So far I cannot recall from my head. I would trust the transcript; therefore, I have to wrest through the whole transcript to see is any other issue I disagree.

Q. So as you sit here today, the only two things you can recall are what you just testified about, correct?

75

MR. HYNES: Asked and answered.

A. Could you say again? Could you repeat the question?

Q. Yes.

As you sit here today, the only two issues you're able to recall are those that you just spoke to me about, correct?

A. Correct.

MR. HYNES: Same objection.

Q. Okay. You are -- do you recall that there was some disagreement about -- well, strike that. I won't go there.

Are you familiar with a testing method called X-ray diffraction?

A. Yes. But I have not reviewed any X-ray diffraction report from MAS.

Q. That's not my question. My question is: Are you familiar with X-ray diffraction?

A. Yes, I do.

Q. All right.

(Technical difficulty.)

BY MR. PLACITELLA:

Q. Have you ever used X-ray diffraction for any type of asbestos analysis?

A. Not asbestos.

76

Q. Okay. Can you use X-ray diffraction to find chrysotile in talc?

A. No, I don't think there are procedure technique to find chrysotile asbestos, I emphasize, not the general chrysotile, but --

Q. Right.

A. -- I know we meant chrysotile asbestos.

No, there's no technique which can analyze chrysotile asbestos by powder X-ray diffraction. It's not any X-ray diffraction; it's called powder X-ray diffraction.

Q. Right.

Can you use powder X-ray diffraction as a screening technique to determine if talc has asbestos in it?

MR. HYNES: Vague.

A. No, because the powder X-ray diffraction could not determine the aspect ratio.

Q. Okay.

A. So it cannot determine any asbestiform minerals.

Q. So, in your expert opinion, X-ray diffraction cannot be used to detect any asbestiform minerals; true?

77

A. No.

Q. And does that include amphiboles as well?

A. As well.

Q. Okay. And that's based upon your 40 years of experience?

A. No, it's not based on my experience; it's based on the principle of the technique.

Q. Okay.

A. The technique can only determine the mineral phase by the crystal structure, but it cannot determine the "morpholog." As you know, the "morpholog" is one of the important criteria to define asbestos mineral.

Q. Okay. So, should X-ray diffraction ever be used as a screening technique as a first step in determining whether a product contains asbestos, in your opinion?

MR. HYNES: Vague; overbroad.

A. I have not research on this project.

Q. Well, in your opinion and experience, is X-ray diffraction a valid method as a first step for screening for asbestos in material?

MR. HYNES: Vague; overbroad; asked and answered.

78

A. Not asbestos, but as a screening tool for mineral identification. There's a difference between the mineral identification and asbestos identification.
Q. Okay.
A. When you say "asbestos," it has to be conform in the "morpholog." Since X-ray diffraction could not determine the "morpholog," so it's accurately speaking it's not screening tool for asbestos.
Q. Okay. Is it a valid screening tool for finding serpentine minerals?
A. That's right. It's a screening tool, I repeat, for mineral identification, not involving "morpholog."
Q. And do you have any idea of what the -- how long -- well, strike that.
I'm going to talk a little bit now about -- just a couple of questions about PLM.
If you're using -- have you ever used PLM to determine whether there was asbestiform and amphiboles in a product?
A. No.
Q. Why not?
A. Because so far I was asked to review

79

the PLM analysis of chrysotile.
Q. Okay. Do you need to do a Becke line analysis to confirm whether something is an asbestiform amphibole?
MR. HYNES: Vague; overbroad.
A. Could you repeat question, please?
Q. Sure.
You talked about the need with Mr. Bradley to perform a Becke Line analysis to determine whether what you're saying is chrysotile, correct?
A. Correct.
Q. All right. Do you have to do the same thing when you're trying to determine whether an amphibole is asbestiform? Do you still need a Becke Line analysis?
A. I'm sure I would need that; however, so far I have not been asked to do that.
Q. Well, I understand you haven't been asked to do it. I'm asking you based on your expertise as a PLM microscopist, whether in order to determine a product, an amphibole product is asbestiform, you must do a Becke Line analysis?
A. Yes.
MR. PLACITELLA: Ben, do you have the

80

document that I gave you?
MR. BRALY: Yes.
MR. PLACITELLA: Could you mark that and give it to the witness?
MR. BRALY: Yeah, it's Exhibit 44.
MR. PLACITELLA: Okay. I want to see if I can share my screen at the same time.
Can you see my screen.
MR. BRALY: Very small.
MR. PLACITELLA: I'll make it bigger.
THE WITNESS: Yeah, I can look at the hard copy. Which page do you want to --
MR. HYNES: Seven.
BY MR. PLACITELLA:
Q. Can you see my screen now, or page 7?
A. Okay. Yeah, I'm at page 7.
Q. Just take a second and look at that.
For the record, I'm showing him Part 2 of the CTFA J4-1 asbestiform mineral analysis protocol. Let me know when you're done looking at it, Doctor.
You with me?
A. Yes, I finished reading.
Q. Okay. Sorry.
Okay. So, under -- see under the

81

section where it says "optical microscopy and dispersion staining"?
A. Yes.
Q. All right. Would you -- in your opinion, is that procedure as outlined in this specification sufficient to identify an asbestos-containing amphibole without anything else?
A. I don't think this correct procedure, or a complete procedure.
Q. And why is that?
A. Because nobody identify asbestos by central stop dispersion staining color; you identify any asbestos component by refractive index. So here it says only about the dispersion staining color in the oil, 1.605. It did not mention how you get the dispersion staining color. Because the dispersion staining color is affected by the intensity of illumination, by the distorted dispersion staining color, also by the calibration of the system, affected also by the color temperature of the light source.
So, the color is affected by so many factors, so nobody ever defined in any literature or any test method to define a asbestos component by color.

82

Q. So --
A. However, the only parameter which can identify is the refract index. The refract index is absolute, is intrinsic property of the asbestos mineral. Whether you measure it in California, measure that in New Jersey, the refract index is the same. However, the color would depend which polarized light microscope you use, what kind intensity of illumination you use, or whether what is the color temperature, what the light source, whether it's a constant or AED, whether you use a daylight filter. They all affect the color displayed by the particle.
So therefore, you can really not, just by saying you can identify simply by color.
Q. Okay. So, up at the top it gives you the list of the apparatus that's part of this spec, right? It says, "Bertrand lens, high-intensity light source."
You see that?
A. Yes, I saw that.
Q. So using that apparatus and this as a specification, could you ever determine definitively whether a mineral that you're seeing is asbestiform or not?

83

MR. HYNES: Vague; overbroad.
A. Anyway, let me emphasize the only way you can determine the asbestos, whether it's chrysotile or amphibole, is to measure its refract index on the polarized light microscopy. This procedure does not tell you how to do that. Also, it did not mention the color temperature of your system. It mention the source, high-intensity light source. You can use a different level of intensity.
Now, you can use the different color temperature. You can use the daylight filter or not. Each variation will affect the central stop dispersion staining color displayed and observed by the operator, by the analyst.
Q. So --
A. Also, a very important procedure here is missing. As I said, you can only identify whether it is asbestos or not by measuring the refract index. This procedure did not tell you about that. Even you observe the dispersion staining color, how do you get the refract index, which is the most important part of the procedure? However, this procedure did not tell you.
Q. All right. So if you gave this specification to ten different microscopists, is

84

there any way to guarantee consistent results just following this specification?
MR. HYNES: Calls for speculation.
A. As I said, not by following this specification. This specification did not tell you the color temperature, did not tell you the light source, did not tell you intensity, many factors which affect the dispersion staining color. And also, it did not tell you, you will have to calibrate the dispersion staining color, again, the specific instrument, the specific setting, and also the specific eyes' perception to the color.
Q. So --
A. There are so many factors, are missing in this specification. So this specification could not produce the correct refract index. I have to emphasize, only refract index can identify whether it is asbestos or not. But this procedure completely missed that procedure, that step.
Q. Could this specification ever identify chrysotile using a PLM, in your opinion?
A. If you know how to correctly perform the dispersion staining technique, if you know how to correctly perform the "methododge" and also you

85

know how to convert the color into the refract index, now you can. If you cannot produce the correct assessment of the central stop dispersion staining color, then you couldn't.
Q. Okay. So how would you guarantee -- so if you had to rewrite the specification, what would you include?
A. Well, if I am commissioned to do that, I will write a very detail step-by-step procedure for analysis. Okay? Then everybody can follow.
Q. Why do you need a detailed step-by-step analysis?
A. Because, as I said, there are so many factors affecting the central stop dispersion color displayed and observed by the analyst. And also, a most important step of procedure is, if you can correctly get the dispersion staining color, then you will have to convert that color into the numerical value of the mineral, then you can identify. Without that step, nobody can.
So this procedure is so incomplete and so vague, but I'm sure I can develop a complete procedure to accomplish this task by correctly measure the refract index of any mineral, opaque

86

mineral by polarized light microscopy.
Q. So I do apologize because I interrupted you. You said you would give a step-by-step detailed procedure. Can you just lay that out for us? How would you rewrite the specification if you really wanted to find out whether a product had asbestos in it or not?
A. Yeah, if I'm commissioned to do that.
Q. Well, you're getting paid by the hour now, so do your best.
A. Nobody ask me. Okay?
Q. I'm asking.
A. Well, okay. I will consider, however, and I can bill you for the time?
Q. We're being billed in the deposition, Doctor. I just want to know if you have to rewrite the specification to make sure it was capable of finding asbestos in talc, what would you -- what would you put in? Give me your outline, at least.
MR. HYNES: Objection to form; asked and answered.
A. I would cover every aspect of the correctly measure the central stop dispersion staining color. First, the method or procedure will cover every aspect about the central stop dispersion

87

technique; secondly, my cover -- my procedure will cover how do you derive the object's refract index by central stop dispersion staining technique.
So there are two major part: First, there are many details about obtaining the correct central stop dispersion staining color; the second major part will be how do you go from the color to the refract index.
Q. Okay.
A. If I will write the procedure, I will cover every aspect.
Q. So if you were giving advice to Johnson & Johnson for what they should do to screen talc for asbestos, would you ever advise them to use this method that's on this document?
A. It have not happened, okay, so I cannot say anything about that. But I can assure you I'm fully capable and qualified to give -- to document a very comprehensive and accurate procedure to perform the analysis.
Q. But here's my question. I know you haven't been commissioned to do it. Would you ever recommend to Johnson & Johnson that they use this procedure to screen for asbestos in talc?
MR. HYNES: Vague; calls for

88

speculation.
A. I have not been asked to; therefore, I don't have to express my opinion. However, if I am asked to, I can do that.
Q. Respectfully, Doctor, I'm just asking a simple question. Would you ever recommend to Johnson & Johnson to use this procedure to screen talc for asbestos? That's my question.
MR. HYNES: Same objection.
A. Why I should recommend to them?
Q. I'm asking you as somebody with experience who's testified now for a couple of days and has 40 years of history using a polarized light microscope, would you ever recommend to Johnson & Johnson that they use this procedure outlined in this specification to test for asbestos in talc? It's a simple question; yes or no?
MR. HYNES: Same objection.
A. It's not yes-and-no question. It is a question: Why should I do that?
Q. Because I'm asking you a --
A. Then if I must do that, of course I can.
Q. Okay. So, I'm asking you in a deposition so we know what your opinions are on PLM

89

whether you would ever recommend to Johnson & Johnson that they use this specification to screen for asbestos in talc. It's a very simple question.
MR. HYNES: Same objection.
A. No, it's not a simple question. You mean what I would recommend, why I will have to recommend. That's the first question. If I have to, then you can ask me whether I would do that or not.
Q. So are you refusing to answer the question, Doctor?
A. I refuse to answer this question not because I am not capable of outlining a detailed procedure, it's I need to know what I should recommend or not. I need to know the reason.
Q. Let me ask you the question this way.
A. Okay.
Q. Are you capable of providing an opinion as to whether this specification...
(Technical difficulty.)
A. Of course I'm capable.
MR. PLACITELLA: We're not sharing a screen anymore, correct?
MR. HYNES: Correct.

90

BY MR. PLACITELLA:
Q. Are you capable of providing an opinion as to whether Johnson & Johnson should ever use this specification to screen for asbestos in talc? Are you capable of giving that opinion?
A. I am capable.
Q. Okay. And what is that opinion?
A. Is that about whether I'm capable of producing a procedure to determine the refract index of mineral including asbestos? I want a clarification on that.
Q. Okay. Let me ask the question a different way.
A. Okay.
Q. If you were a scientist working at Johnson & Johnson and assigning somebody the task of determining whether there's asbestos in talc, would you ever hand them this specification with no other instructions and say, "Follow this specification"?
MR. HYNES: Objection to form; calls for speculation.
A. I still don't understand your question because my job here is to assess the analytical report by MAS. They found asbestos in the chrysotile to be exactly in the baby powder

91

product. My job is to assess whether their report is correct or not.
Q. Well, let me ask you the question this way: You indicated earlier when I was questioning you that Dr. Longo's lab was able to generate data and photographs that you could rely upon in forming your own opinions, correct?
A. Correct.
Q. If Dr. Longo's lab followed this specification, would they be capable of generating reports and data that you could rely upon?
MR. HYNES: Incomplete hypothetical; calls for speculation.
A. Which specification? Could you please clarify?
Q. The specification in front of you for PLM for Amphiboles - Part 2.
MR. HYNES: Same objections.
A. If they perform the technique correctly, that is the prerequisite. If they are incapable performing the technique correctly, they can't; however, if they truly understand the optical crystallography, polarized light microscopy and optical "mineralog," of course they can. However, as I repeat, this procedure is so complete [sic], it

92

did not tell the analyst how do you determine the refract index. So, therefore, this specification is very incomplete.
Q. Would you agree with me that this specification indicates it's for amphiboles only?
A. Not for any mineral.
Q. It says for amphiboles; does it not?
A. No.
Q. It doesn't? Are we looking at the same thing?
A. It doesn't.
Q. What's the title say on Phase 2 at the top of the page?
A. Well, the title is "Specification" -- let me see. Also on the top of the cover, CTFA, Cosmetic" --
Q. I'm just talking about the top of the page we're looking at.
A. Yes, "CTFA Specification."
Q. Right. Okay. And does it say "asbestiform amphibole minerals"? Top of page 7.
A. Talc.
Page 7, yeah, amphibole.
Q. Amphibole.
Would you agree with me as written

93

this was never intended to find chrysotile in talc, if it existed?
A. No. As I said, this specification is so complete, and also, it lacks so many details.
Q. When you say "complete," you mean incomplete, correct?
A. Incomplete, yeah.
Q. Incomplete.
A. Not complete.
Q. Not complete.
A. Yeah. Incomplete.
Q. So we're on the same page, and I'll stop.
As written, this specification is so incomplete that there's no way it could be used on its face to determine whether there's asbestos in talc; true?
A. No.
Q. Would you agree with the following statement: "It's imperative that both dispersion staining color and fibrous morphology criteria be satisfied, as well as the Becke Line determination of refractive index, before identifying a particle as asbestiform amphibole"?
A. Not according to this specification.

94

Q. And so this specification fails in that regard, correct?
A. That's right.
Q. Okay. Let me just look here. We might have to take five minutes so I can talk to Ben. He'll tell me what else I forgot. So why don't we just take five minutes. Okay?
A. Okay.
(Recess: 11:59 a.m. to 12:06 p.m., Eastern Standard Time.)
MR. PLACITELLA: So, I don't have any other questions at this time, and I'm hopeful you can get out of New Brunswick and beat the traffic before it gets bad. So, unless somebody else is going to ask any other questions, I'm done.
MR. HYNES: Are there any other questions from people on the line? Hearing none, I will have a couple questions, Dr. Su. Thanks again for sitting for this deposition over the last two days. Appreciate it.
THE WITNESS: Thanks.
REDIRECT EXAMINATION BY MR. HYNES: ^
Q. The first thing I wanted to ask you was today you mentioned this concept of birefringence. You described it as the absolute

95

difference between the alpha and gamma refractive index values. Is that right?
A. Correct.
Q. So if we looked at some of the sources that you cited in your report, such as R-93, Bloss, ISO 22262-1, we would see that birefringence is defined as this absolute difference between alpha and gamma, correct?
A. Correct.
Q. Okay. And this idea that you may see a range of refractive index values in chrysotile from the same source, that's something that you don't agree with. Is that right?
A. No.
Q. You will see one true refractive index in alpha and one true refractive index in gamma. Is that right?
A. Correct.
Q. Okay.
MR. PLACITELLA: Let me just put my objection on the record. I'm not going to keep doing it, but these are leading questions of an expert witness in a deposition, and I'm going to object to any of those questions. And if you give me a standing objection to your leading questions,

96

then I won't interrupt anymore.
MR. HYNES: Standing objection.
BY MR. HYNES:
Q. Dr. Su, you also described in, I think, day one of your deposition that you would refer to R-93 for refractive index values in chrysotile. Is that right?
A. R-93, EPA method?
Q. Yeah. Table 22, I think.
A. Yeah, that is the table describing the refract index of the asbestos minerals.
Q. Okay. And then do you also cite ISO 22262-1 in your report?
A. Yes.
Q. Okay. And does ISO 22262-1 include known ranges for NIST standard chrysotile refractive index values?
A. Say again, what question is?
Q. Does ISO 22262-1 also include known ranges for refractive index values for NIST standard chrysotile?
A. Actually, I don't know because I never reads that section, if there is a section of that.
Q. Okay.

97

A. Because I know what refract index 86 is. Okay?
Q. Okay. So if it's reported in there, it's reported in there. That's fine.
Then you were asked a series of questions about this concept of Becke Line analysis. There are methods for determining refractive index values of a mineral using Becke Line analysis independent of any central stop dispersion staining analysis. Is that right?
A. Correct.
Q. Okay. The central stop dispersion staining analysis uses Becke Line as a complementary way to determine what part of a particle that you're looking at under central stop dispersion staining color, you should use to assign the correct refractive index value. Is that right?
A. Correct.
Q. Okay. And so, this concept of Becke Line analysis, it's not that it's a independent method, it's part of how a trained analyst who knows how to perform central stop dispersion staining will perform their central stop dispersion staining analysis. Is that right?
A. No.

98

Q. Tell me more, then.
A. Yeah, the Becke Line is not a dependent method; it is the independent method. Matter of fact, you can determine the opaque minerals refract index simply by Becke Line, but you cannot do this for central stop dispersion staining color technique without Becke Line method to differentiate the distorted dispersion staining color from the normal correct dispersion staining color.
Q. Okay. So, is it true that a trained analyst who understands the principle of central stop dispersion staining will, in order to determine what are true dispersion staining colors versus distorted staining colors, they will refer to the Becke Line to make that call?
A. Yes. Yes.
Q. Okay.
A. A very important part of the procedure is to recognize which part of the dispersion staining color is the normal dispersion staining color and which part of the dispersion staining color displayed is distorted dispersion staining color. Now, to differentiate between these two, you have to use the Becke Line. So far that's

99

my experience.
Q. Okay. You were asked some hypotheticals about bundle thickness and its impact on refractive index values. In central stop dispersion staining analysis, is it true that bundle thickness will not change the refractive index of a mineral being analyzed?
A. No, because the refract index is an intrinsic physical property of any crystal, any minerals. It was determined by the elemental composition, the chemical composition, and the crystal structure, the way how those atoms connect to each other.
Now, these two property were not change with size or thickness of a material, a mineral. So, even the size of the change, the refract index is not. Again, I have to, if refer to asbestos to chrysotile, and we have evidence, as I said, the standard reference material 1866 series, whether 1866, 1866a or 1866b, they are measured as single fibrils. You cannot go any thinner than that. Therefore, the refract index value, the gamma 1.556, alpha 1.549 is for the chrysotile. It did not change with the fiber size or bundle size.
Q. Shifting gears: Counsel for

100

plaintiff marked Exhibit 41, a series of count sheets for TEM analysis of chrysotile SG210.
Do you recall reviewing that for the first time during today's deposition?
A. Yes.
Q. Okay. The count sheets and photomicrographs that you were provided, do they provide any information for you about the sample preparation process for the materials being analyzed here?
A. Sample preparation?
Q. Correct.
A. Standard TEM grid preparation.
Q. But do you know what was done, whether or not there was liquid density separation technique used, sonication performed, wet-sieving, anything of that nature before these materials were analyzed by TEM? Is that information included in what you were shown today?
A. No.
Q. And sample preparation procedures may impact the size distribution of particles that are being analyzed subsequently by TEM, right?
A. Correct.
MR. BRALY: Object. He's offered as

101

an expert in PLM. But go ahead. That's fine.
BY MR. HYNES:
Q. You answered that's right, right?
A. Yes.
Q. And you were asked some questions about a NVLAP inspection in 2016.
Do you recall that questioning?
A. Yes, I did.
Q. That's when you were an assessor and you went to MAS's laboratory to review the conditions at the time in, I believe it was September of 2016, correct?
A. Correct.
Q. That predates any of the Johnson & Johnson reports that you've reviewed in this case, correct?
A. No. No, I was not aware of -- again, they have not give me any of those material for me to review. And the assessment, as matter of fact, only concern two technique: One is the bulk asbestos analysis by EPA, the second is the airborne asbestos analysis by EPA. So that's only two technique I need to assess, not actual sample they apply that. But normally, we want focus on AHERA. I will ask them AHERA analysis, but not any other

102

client request.
Q. So the types of analyses that you reviewed that Dr. Longo produced in which he identified chrysotile by PLM in Johnson & Johnson Baby Powder containers, those sorts of procedures were not something you evaluated during that visit in 2016?
A. No, not at all.
Q. And then correct me if I'm wrong, but would a laboratory that receives a NVLAP audit receive the audit reports that are prepared by the assessor, and then the reviewer who assesses the report of the assessor that actually made the site visit would they get those materials?
A. Oh, yes, they do. Actually, before the assessor leave the lab after the completing the assessment, you will have to review the whole report and get their signature. You have to give them a complete copy, which have the three form, the general criteria form, the polarized -- the bulk asbestos form, the PLM form, and the third is the TEM form.
Q. And have you been a reviewer of an assessor's report at MAS since this 2016 timeframe?
A. Yes, I did.

103

Q. Did you have criticisms of MAS after this 2016 NVLAP report was issued?
A. Yes. And I recognized there's a page of the -- my assessment in 2016, and there is a page of Dr. Bo Li's assessment in 2021, let me see, 2021 or 2022. Yeah, I saw a sheet that remember me, yes, I reviewed Dr. Bo Li's assessment report. That is part of the NVLAP procedure. I did not ask to review -- assign the review work to me.
Q. And you got criticisms of MAS's PLM procedures in that 2021 --
A. Correct. Because one of the nonconformity reported documented in Dr. Bo Li's report is they confuse the alpha and gamma for chrysotile in their count sheets. And when MAS respond to this report to this nonconformity, they said it did not affect the past analysis because NVLAP procedure required where you identify a nonconformity, one of the thing the lab will have to review what kind impact are your past work, if you made some mistake, now, what kind of impact on the past work, until this time the mistake was identified by the assessor.
So I remember the response from MAS was it did not affect the past analysis, which I

104

don't -- I did not agree, because that is so basic, such a major mistake. Alpha is smaller than gamma. How could you, in your bench sheet, you said the alpha is greater than gamma? Of course this mistake affect every report you issued before Dr. Bo Li's assessment. Okay?
So the lab respond and says we were correct that; however, we don't think it would affect the past results. Therefore, in my comments I said there's such a fundamental mistake, sure it will affect, because all your past reports, they were wrong. I remember I made that comment in my review.
Q. And that was -- those comments and that review, that all happened before you had ever seen any of Dr. Longo's analyses of chrysotile in cosmetic talcs?
A. No, it was in 2021, I wasn't aware. I know nothing about the talc sample.
Q. Okay. And do you know whether or not Dr. Longo's laboratory is currently a NVLAP accredited laboratory for PLM work?
A. Not right now, but they used to. They used to, I think.
Q. All right. You were asked a number

105

of questions about the CTFA J4-1 methodology.
Do you recall those questions by Mr. Placitella?
A. Yes.
Q. Were you familiar with the specification before you saw it during the course of today's questioning, or is this the first time that you've seen it?
A. That's the first time I saw that.
Q. Okay. So you don't know when this was promulgated?
A. What?
Q. Do you know what year this was promulgated?
A. No. Must be a number of years ago. I think I had some vague impression reading some paper, they said there was a method, but I never seen that method document myself.
Q. Okay. And you don't know any of the context in which this method was developed. Is that right?
A. No, not at all.
Q. Okay. And one of the things that you mentioned here was that the method itself doesn't provide, you know, the level of specificity that you

106

would require for soup to nuts polarized light microscopy analysis of asbestiform minerals in talc. Is that right?
A. That's right.
Q. Okay. You would go to other potential references for further information about how to perform the specific central stop dispersion staining analysis beyond what's presented on this page 7 of what you were shown. Is that right?
A. That's right.
MR. PLACITELLA: Objection; leading. Objection; leading.
MR. HYNES: Go ahead.
A. However, the major -- major flaw of this specification is, they did not have the key procedure to determine the numerical refract index of the amphibole. Without that data, there's no way you can identify whether the target object is amphibole or not.
Q. Say, in 1976 or 1977, what references would you go to for that information that you just described?
A. I don't know. Maybe McCrone. Okay?
Q. Okay.
A. Dr. McCrone had developed the graphic

107

solution from dispersion staining color to the numerical refractive index. I believe at that time Dr. McCrone had that procedure. You can use his graphic solution to get the numerical value of the asbestos mineral or any mineral from its central stop dispersion staining color.
Q. And one of the things that's noted on the following page is that dispersion staining device that's commercially available would be from Walter McCrone. Is that right?
A. That means the dispersion staining objective.
Q. Right.
Okay. And then you brought a couple of documents with you to today's deposition. I don't know what they are, so, do you want to just tell us what they are and maybe we'll mark them as exhibits.
A. Okay.
MR. PLACITELLA: Are these documents that have been disclosed before?
MR. HYNES: He brought them with him to today's deposition, so I do not know.
MR. PLACITELLA: Well, that's not fair and I object to any questions about them.

108

That's not fair. You knew they were coming. If you had that document he was bringing, he should have disclosed them. I mean, this deposition by ambush that you've been conducting now for two days needs to stop.
MR. HYNES: I apologize, Mr. Placitella, however --
MR. PLACITELLA: There's no apology. This was deliberate. This was deliberate. He had the documents. You could have turned them over and you didn't.
MR. HYNES: Well --
MR. PLACITELLA: And I will bring it to the Court's attention.
MR. HYNES: Why don't we walk through it with him and you can decide whether or not you want to continue to object.
BY MR. HYNES:
Q. Go ahead, Dr. Su. What did you bring?
A. Okay. The first one is my -- my paper in 2022, "The Dispersion Staining Technique and Its Application to Measuring Refractive Indices of Non-Opaque Materials With Emphasis on Asbestos Analysis," which was published in the journal, "The

109

Microscope." That's the first thing I brought.
Q. That was Exhibit 13 to day one?
A. Yeah. That was on the first day deposition.
The second thing I brought was the transcript --
Q. Exhibit 32.
A. Exhibit 32 of the last deposition.
The third document I brought, yeah, was two table, which one is the chrysotile in Cargille oil, 1.550; the second is the chrysotile in Cargille 1.560, which were used to -- by MAS.
MR. BRALY: Do you mind if I just take a look at them?
A. (Handing.)
Q. So those are your --
A. Yeah --
Q. -- tables?
A. That's my table plus the ISO dispersion staining color chart provide by -- from ISO document.
MR. HYNES: Okay. So, and that's -- just for the record, so I guess what we have is, it looks like -- so the first page in this manila folder is chrysotile in Cargille 1.550 E, and

110

so it looks like Dr. Su took the alpha and gamma 21 degrees Celsius from his 2022 publication along with the wavelength column of that table, and then in the middle of those he put the ISO color bar.

Q. So everything is together on one page. For ease, you're matching up. Is that right?

A. Yes.

Q. Okay. And then the next page of this is the same thing, with the 1.560 from that. I guess it's the excerpts of the table from the same publication. Is that right?

A. Correct.

Q. Okay. And then the next is just the full table for 1.550; and then the next is the full table for 1.560, right?

A. Yeah.

Q. Okay. And then did you bring anything else with you?

A. Yeah. The third document I brought is my MDL report on May 21st of 2024.

Q. Okay.

A. I think that's all.

Q. Right. I guess -- so, why did you bring these charts, Dr. Su?

A. Yeah, because I was evaluate the

111

Exhibit 32, because I was asked in last session about the bentonite report by MAS. At that time I answered they are Calidria chrysotile. Now I realize after I exam the Exhibit 32 provide by the plaintiff, I realize my answer was wrong. They were not Calidria chrysotile.

Q. Okay.

A. And based on the refract index value, document MAS micrograph, the photo. Because the value indicate the alpha and the gamma value is totally different from the Calidria chrysotile. And the birefringence, the number one sample is .03, or 13. The rest is 6. The range value is .017 to .019, which is completely -- which is out of the range of any chrysotile, let alone the Calidria. The Calidria birefringence is .005.

Every sample in this exhibits is way above that. They range from 1.013 to .019, whereas the Calidria chrysotile is .005; therefore, none of this minerals, they are Calidria chrysotile.

Q. Looks like there's one more thing that you, I guess, brought with you. It's this one page --

A. Okay. Yeah, I summarized that.

Q. I guess we have a one-page sheet.

112

A. Yeah. Just from Exhibit 32.

Q. Okay. I guess for the record we should mark 45, we'll mark those four tables you made; and then 46, we'll mark the one-page sheet. And then it looks like you put Post-Its on Exhibit 32, so we'll mark that all as one.

MR. PLACITELLA: Just for clarification, the tables were created between last deposition and this deposition?

MR. BRALY: No, Chris. It's just a central stop dispersion staining table.

MR. PLACITELLA: I can't see it. That's why I'm asking.

MR. HYNES: Yeah, these are just -- yeah, basically, he took his table from that publication he carried in with him.

MR. PLACITELLA: Okay. Got it.

MR. HYNES: And he put an ISO color bar.

THE WITNESS: Can you show this on the screen?

MR. BRALY: No, we're fine.

BY MR. HYNES: It will be marked as an exhibit, and we'll mark this handwritten set of stuff as 46.

113

THE WITNESS: Okay.

MR. HYNES: And that's it.

Questioning?

MR. BRALY: Yeah, briefly.

RECROSS-EXAMINATION BY MR. BRALY:

Q. Dr. Su, you're almost through here. Congratulations. You survived your first deposition.

Using the Becke Line analysis to complement dispersion staining is something that you have never published until 2023, correct?

A. Yes.

Q. That is correct?

A. That's correct.

Q. Great.

Nowhere in your report, which is Exhibit 3 to this transcript -- nowhere in your report did you criticize how Dr. Longo calculated his birefringence, correct?

A. I think I did.

Q. No, you didn't, actually. And if you want to -- we can go to Exhibit 3, probably present this to you pretty easily.

A. Which page?

Q. Well, give me a second. We're going

114

to do this on the screen here.
Here we go. If you take a look at the screen in front of you.
A. Yes.
Q. So this is your report, Exhibit 3. It's 99 pages long, right?
A. Yes.
Q. If you do a word search for the word "birefringence," it appears three times in this entire document.
Sir, if you'll pay attention to the screen, please.
A. Okay.
Q. It appears three times. The first time it appears twice in one paragraph on page 3, the word "birefringence."
Sir, can you please pay attention to the screen?
A. Yes. I will find it on hard copy.
Q. I'm telling you. It's page 3 of your report.
A. It's easier for me to read from this color copy.
Q. Okay.
A. Page 3. Yes.

115

Q. And what you're saying is that if you have the wrong RI value, that you will get a subdued birefringence value, correct?
A. Correct.
Q. Meaning that the relationship between RI is a relationship to the resulting birefringence calculation?
A. Correct.
Q. Okay. So you mentioned the word "birefringence" two times in this one paragraph in Exhibit 3?
A. Yes, I did.
Q. Now, you if you'd pay attention to the screen.
A. Okay.
Q. The only other time "birefringence" appears in your report is in your bibliography, in an article from 1989.
Do you see that?
A. Yes, I do.
Q. The word doesn't appear in your report in any other location. So it is a true statement that you never articulate a criticism of the method by which birefringence was calculated by Dr. Longo, correct?

116

THE WITNESS: Can I answer now?
MR. HYNES: Yeah.
BY MR. BRALY:
Q. I mean, it's a yes-or-no answer.
A. My answer is: The birefringence is a secondary product -- property. It was determined by the primary property after refractive index.
Q. I agree. And that's what you said in Paragraph 3.
A. That's right.
Q. Yes. What I'm asking is, you never criticized the method by which it was calculated in Dr. Longo's -- you never discussed that in your report, correct?
A. I don't have to --
Q. Just answer my question. You don't discuss that in the report, correct?
A. No.
Q. Thank you.
Your 2021 NVLAP review, the review that was done by Bo Li that you had comments about.
A. Yeah.
Q. Do you have documents pertaining to this NVLAP review?
A. You see, the review was done on the

117

portal of the NVLAP. So first they assign me to review --
Q. Sir, I am just asking you: Do you have documents relative to the 2021 --
A. That's what I'm answering.
Q. Okay.
A. It is document in the portal of the NVLAP.
Q. Do you have access to that portal?
A. Of course I have access as assessor.
Q. I mean, is that something that you can download from the portal and --
A. No, we are not allowed to download it; we can only write input in the portal. And also, like once I finish my review, then the MAS, the target lab will be able to see my comments in the portal.
Q. Okay.
A. We are not allowed to print or download that.
Q. So, your comments, if I understood it correctly, was that Bo Li recognized an error had been made relative to the assignment of alpha and gamma values?
A. Correct.

118

Q. And that Bo Li, who was the analyst who had done that review, said essentially that this was a isolated mistake and shouldn't affect prior studies, or something to that effect, and you disagreed with that?
MR. HYNES: Misstates testimony.
A. No, no, no. It's not Dr. Bo Li. It is MAS --
Q. No, I understand that. I'm sorry. Let me re-ask the question, then.
A. Okay.
Q. Was it Bo Li -- that's a woman, correct?
A. No.
Q. Bo Li's not a woman?
A. A man.
Q. I'm sorry. So Bo Li did a review, and is it correct that he concluded that this was an isolated error that should not affect prior reviews, and you disagreed with that?
MR. HYNES: Misstates testimony.
A. I don't think you express that correctly.
Q. Okay. Please do.
A. Let me say.

119

Q. I appreciate it.
A. First, Dr. Bo Li did the assessment by remote, because during pandemic he could not physically present at the lab; however, he identify we don't use isolate or not, we only use its nonconformity or not. So nonconformity means in this requirement what the lab did not comply with the requirement by NVLAP; therefore, it was identify as nonconformity.
Q. Okay.
A. So after his assessment, the lab, all they need to do is to look at are there nonconformity or not; if there are, they are required to respond to NVLAP. Okay. Whether there's nonconformity is how they are going to correct that, the corrective action, also the cause of the root cause analysis, why I made this mistake.
The third thing they need evaluate, whether this has impact to the past analysis. If it is, the lab is supposed to inform the customer of previous analysis about the impact, the mistake they made. Yeah, that is the NVLAP procedure and the policy.
Q. Okay. So if you're going to answer my question, I would appreciate it.

120

Did Dr. Bo Li find -- I mean, was this ruled to be an isolated incident?
A. Dr. Bo Li --
Q. Just answer my question: Was this an isolated incident? Was that the determination of NVLAP?
A. No, it is nonconformity; it's not isolate incident.
Q. It was a nonconformity from one evaluation?
MR. HYNES: Can we go off the record for one second?
MR. BRALY: Yes, it'll be fine.
(Discussion held off the record.)
BY MR. BRALY:
Q. Dr. Su, I just want to understand this issue a little bit better because I don't have the access to the documents that you do, okay? So you're saying that there was a comment made about a nonconformity --
A. Excuse me. Could you repeat the question, please?
Q. Yeah.
I just want to understand, so, there was a review of the lab, right?

121

A. To be exact --
Q. No, no, no. I'll re-ask it.
A. No.
Q. I don't want a long answer. Let me try to understand this: There was a nonconformity found with the lab, right?
A. By the assessor.
Q. Okay. And then there was a report issued, correct?
A. What do you mean, "report issue"?
Q. What happened after the nonconformity was found?
A. The lab has 30 days to respond to NVLAP.
Q. Did they respond?
A. They did.
Q. Okay. And did you, in turn, issue your own comments in response to MAS's initial response?
A. Yes I did.
Q. Okay.
A. I was assigned by NVLAP to review their response.
Q. Okay. And it's your review of the response where you are saying in your opinion that

122

calls into question everything that they've done by PLM up to that point, correct?
A. Only for that specific nonconformity.
Q. Okay. And that specific nonconformity was -- how would you characterize that nonconformity again?
A. They switch the alpha and the gamma in their bench sheet. Of course that affect the report.
Q. Sure.
And they switched alpha and gamma in a report in the bench sheet, correct?
A. I am not Dr. Bo Li. If it's only in one bench sheet, you are not supposed to identify that nonconformity. It is a nonconformitying (phonetic) in any of their bench sheets.
Q. Doctor, here's the problem I have: You've reviewed probably close to a dozen PLM reports by MAS where gamma is in excess of alpha in their values. They clearly did not switch them.
A. Which report?
Q. Any of the dozen or so Johnson & Johnson PLM reports that you've reviewed.
A. After that.
Q. Well, a lot of those were dated

123

before '21, were they not? A few of them?
You didn't notice in any of the Johnson & Johnson reports that MAS had flopped the gamma value and the alpha value such that alpha exceeded gamma, correct?
A. No, because I was asked to review the assessment report in 2021; therefore, I only review their response to the noncomformities identified by Dr. Bo Li. It's nothing to do with their talc Johnson & Johnson Baby Powder analysis.
Q. I'm counting up more than a dozen reports prior to March of 2021 that are on your Exhibit B that you reviewed, PLM reports that MAS did. I just want to make sure I'm clear about this. You are not saying that in any of those reports that MAS made a systemic mistake of flopping alpha and gamma, correct?
A. Correct.
Q. Okay. That's all I needed to check.
A. Okay.
Q. As it relates to the bentonite issue, if the only two mixtures in that sample were bentonite and Calidria talc -- that's terrible. Look at me making mistakes. I'm making mistakes.
Going back to the bentonite sample,

124

if the only two mixtures in that sample are bentonite clay and Calidria asbestos --
A. Okay.
Q. -- what is the particle that's in those images, if not asbestos?
MR. HYNES: Incomplete hypothetical; assumes facts.
A. Well, the only conclusion about that particle is by their own data. See, they document that refract index of each particle, and those value don't conform to Calidria chrysotile.
Q. I 100 percent understand what you're trying to say, 100 percent get you.
A. Okay.
Q. My question to you is: If the only substances in the mixture being looked at are bentonite clay and asbestos, then what is it? Do you have any idea what that particle is that appears in those images?
MR. HYNES: Same objections.
A. If I am asked to make a determination because their data showed it is not, however, if I was asked to confirm whether the identification is correct or not, whether it is the Calidria chrysotile, I would have to analyze the sample

125

myself.
Q. So, you don't know what it is?
A. Before I examine that.
I only know that from their report. From their report, it's not.
Q. Right.
Wouldn't it -- I mean, so, let's talk about the scientific method for a moment. All right?
A. Okay.
Q. If you're coming to -- if you're wanting to figure out the refractive index of a previously uncategorized mineral. Okay?
A. Okay.
Q. And you have a known sample of that mineral, and you conducted an analysis to figure out what the refractive index of that mineral would be.
A. Yes.
Q. That's how you figure these things out, correct?
A. Yes.
Q. Okay. So if the only two options of what is in that bentonite mixture is some mineral and bentonite, whatever the mineral is in that mixture is what is being evaluated and reported,

126

correct?
A. Correct.
Q. Okay. You're saying it can't be chrysotile because of other data showing a lower value for refractive index, correct?
A. Let me clarify. I know your question, because there are only two components: One is SB 210 chrysotile, and now there's a bentonite. If it's not bentonite, what else it could be, right?
Q. That's my question.
A. Yes. That's a very good question.
Q. Thank you.
A. It all come down to very basic question, the test method -- whether you can correctly perform the test method. If MAS is capable, correctly perform the refract index measurement, it is the first criticism in my MDL report, as said, incorrect refract index measurement.
Again, this report showed they are incapable of correctly perform that procedure. If they could, then they would not make the mistake. The refract index should be correctly measured, documented.

127

Q. Okay. When did you and Mr. Hynes get together to talk about your testimony relative to the bentonite clay issue?
A. No, we have not talk about that.
Q. Come on, now.
A. No.
Q. Come on. You've been so straightforward with me for the last couple days. You guys didn't talk about your bentonite clay opinions before you came in here?
A. You see, I only got this formal copy yesterday. And when I looked at, the first thing I check is all the information in this exhibits.
Q. Yeah.
A. I am fully capable to form my opinion. I don't have a consult with anyone. You see, this a very simple task, whether this micrograph showed it is Calidria chrysotile, because my answering last time it was, now I realized it was not.
Q. Okay.
A. You see, I don't -- really don't have to consult with anyone about this.
Q. All right.
A. Okay? Yeah.

128

MR. BRALY: Kevin, are the tabs that are on, are you including that as part of what you're producing?
MR. HYNES: We should. It looks like --
THE WITNESS: I just write down the value.
MR. BRALY: I know. It's fine. I want to make sure we have a record of what it is he tabbed.
With that, I can pass the witness.
MR. HYNES: Give me --
MR. PLACITELLA: I've got a couple of minutes.
MR. HYNES: Okay, Chris. Go.
RECROSS-EXAMINATION BY MR. PLACITELLA: ^
Q. I know I'm standing between everybody and lunch. So, I'll try to be two minutes. Can we go back to Exhibit 42, please. That's the exhibit I was asking you about before.
MR. BRALY: 42 is the exhibit about wet-sieved talc.
MR. PLACITELLA: Oh, what's the one --
MR. BRALY: If you're looking for the

129

J4-1, that's 44.
MR. PLACITELLA: 44. Give me 44 please. Let me know when you have it in front of you.
MR. HYNES: He has it in front of him.
A. Yes.
BY MR. PLACITELLA:
Q. Remember, this was the document you went through that you said should not be used to determine whether there's asbestos in talc.
Do you recall that?
MR. HYNES: Objection; misstates testimony.
A. Could you say the question again?
Q. This is the document we spent some time on before, what you said should not be used to determine if there's asbestos in talc as a specification. You had problems with it, right?
MR. HYNES: Same objection.
A. That page is for amphibole. Okay? Page 7 is asbestiform amphibole mineral by optical microscopy and dispersion staining.
Q. Okay.
A. I think it's not applicable to

130

determine amphibole.
Q. Okay. Mr. Hynes asked you a question about you don't know how long the specification that you're critical of was in effect.
Do you recall that, him asking you that question?
A. No, I don't. I don't know which year it is, so put out so --
Q. Can you go to the very first page.
A. Okay.
Q. All right. Now go to the second page.
A. Hold on. Okay.
Yes.
Q. See where it says "copyright 1971" all the way through 1990?
A. Correct.
Q. Does that give you some information about how long this specification, or some version of it, was being used?
A. Correct.
Q. That's all the questions I have. Thank you.
MR. BRALY: I think you might be through.

131

Mr. Garde, do you have any questions?
MR. HYNES: I don't think Mr. Garde has any questions. All right. Let's go off the record.
(Deposition adjourns: 12:58 p.m., Eastern Standard Time.)

Exhibit 74

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

Chain of Custody: 308006
Client: US Food & Drug Adminitration
Address: Office of Cosmetics & Colors
4300 River Road
College Park, MD 20740
Attention: John Gasper

Job Name: Task 3 - Analysis of Official Samples
Job Location: 4th Group - 15 Samples
Job Number: CLIN 1 - Task 3
PO Number: HHSF223201810337P

Date Submitted: 7/24/2019
Date Analyzed: 8/20/2019-9/18/2019
Report Date: 10/3/2019
Date Sampled: Not Provided
Person Submitting: Goran Periz
Revised: 10/11/2019 (Revision #2)

SUMMARY OF ANALYSIS

AMA Sample ID	Client Sample ID	TEM LOD Using ASTM D5756 Mass Calculation	TEM LOQ Using ASTM D5756 Mass Calculation	% Tremolite by TEM Using ASTM D5756 Mass Calculation	% Chrysotile by TEM Using ASTM D5756 Mass Calculation	% Total Tremolite & Chrysotile by TEM Using ASTM D5756 Mass Calculation	% Asbestos by PLM	% Organics	% Acid Soluable	% Other	Comments
308006-6	D-58	0 00000169%	0.00000675%	ND	ND	ND	ND	0.3%	6.7%	93.1%	Gravimetric Loss from PLM Prep: Organics = 0.3%; Acid Soluable = 7.1%; Other = 92.6%
308006-6A	D-58	0 00000133%	0.00001485%	ND	< 0.00001%	< 0.00001%	ND	0.2%	19.5%	80.2%	Gravimetric Loss from PLM Prep: Organics = 0.2%; Acid Soluable = 8.5%; Other = 91.3%
308006-6B	D-58	0 00000135%	0.00000540%	ND	0.00002%	0.00002%	ND	0.2%	11.2%	88.6%	Gravimetric Loss from PLM Prep: Organics = 0.3%; Acid Soluable = 5.5%; Other = 94.2%

LOD = Limit of Detection **LOQ** = Limit of Quantification **ND** = Not Detected **PLM** = Polarized Light Microscopy **TEM** = Transmission Electron Microscopy

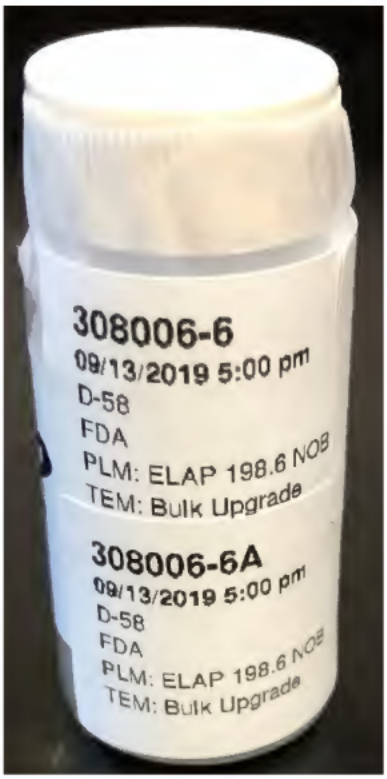
Analytical Method(s): PLM by Modified NY ELAP 198.6
TEM by Modified NY ELAP 198.4/ASTM D5756

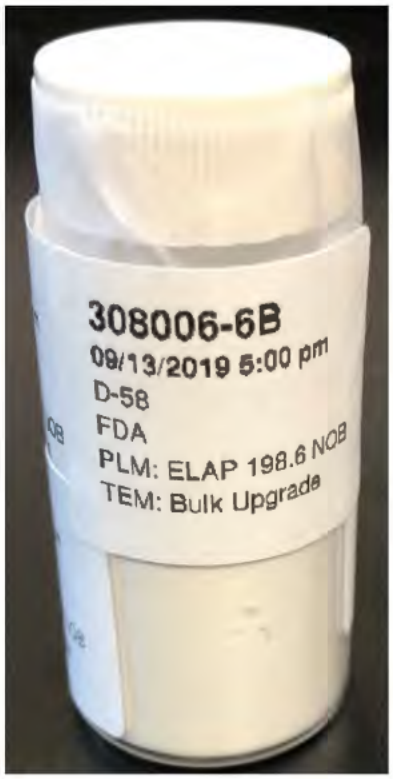
Analyst(s): PLM (b) (6)
TEM (b) (6)

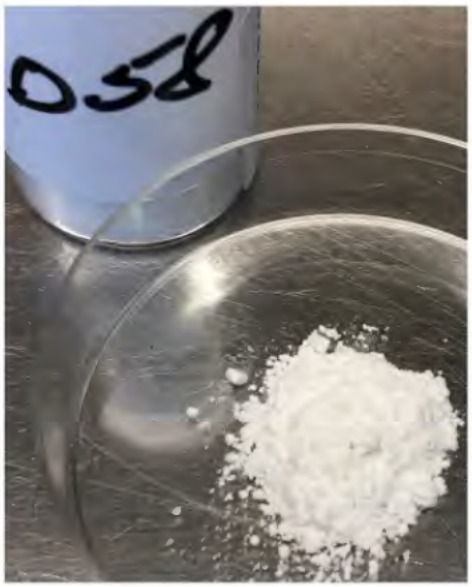
Technical Director: Andreas Saldivar

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy

308006-6, 6A, 6B/D58







Sample Preparation

Samples were prepared for PLM and TEM bulk analysis by (b) (6) on August 13, 2019 through September 5, 2019. Sample preparation consisted of the following steps:

1) Label and weigh two 8mL glass vials for each sample in the set – one vial for the PLM preparation and one vial for the TEM preparation.
2) Weigh out 0.1 to 0.8 grams of material and place in corresponding 8mL glass vial. Record weight.
3) Burn samples at 480° C for at least 12 hours.
4) Record Post-Ash Weight.
5) Treat ashed sample with concentrated hydrochloric acid.
6) Filter acid reduced material onto a pre-weighed 47mm 0.4um PolyCarbonate filter.
7) Place filter into drying oven for 30 minutes and then record Post-Acid Reduced weight.
8) Make four PLM slide preparations from the PLM residual ash for each sample in 1.550 dispersion oil. Make additional preparations in 1.605, 1.625, 1.680 and 1.700 dispersion oil as necessary for particle identification.
9) Weigh a portion of the residue from the TEM residual ash and place it into the corresponding pre-weighed 100ml jar.
10) Fill the 100ml jar with deionized water
11) Sonicate the jars for approximate 5-minutes.
12) Filter 0.2ml to 1ml of the solution onto a 47mm 0.22um MCE filter.
13) Dry the filter for 10 minutes then collapse, carbon coat, and place on a 3 TEM grids.

PLM Analysis

Analysis was performed in accordance with NY ELAP 198.6 protocols. The analysis was conducted using an Olympus BH-2 polarized light microscope (PLM) equipped with a dispersion staining objective. All four slide preparations for each aliquot were examined. 400-point count was performed for those samples on which asbestos was observed. If no asbestos was detected on any of the slides, the percentage of fibrous components was determined by visual estimation. The results of this analysis are detailed below in the *Discussion and Interpretation of Analytical Findings* section for each individual sample.

TEM Analysis

Analysis was performed in accordance with modified NY ELAP Method 198.4 protocols. The analysis was performed using a JEOL JEM-100CX II transmission electron microscope (TEM), equipped with a Thermo Fisher Quest Energy Dispersive X-Ray Analyzer (EDXA), at magnifications of 19,000x. Two grids for each aliquot were examined. Twenty (20) grid openings were examined per sample.

Modifications to the NY ELAP 198.4 Method were:

1) The residue was not placed in alcohol and prepared using the quick drop method. To obtain a more uniform preparation, the residue was placed in a jar and filled with 100ml of deionized water. The jar was sonicated, and a portion of the solution was filtered onto a 47mm 0.22um MCE filter.
2) The tremolite and chrysotile were not visually estimated. The length and width of the observed particles were measured, and the mass of each amphibole particle was calculated using the ASTM D5756 method.
3) All particles identified as tremolite were included with the counts/concentrations, regardless of size and aspect ratio.

The results of this analysis are detailed below in the *Discussion and Interpretation of Analytical Findings* section for each individual sample.

Calculations

ASTM D5756 Mass

$M = \pi/4 \; L * W^2 * D * 10^{-12}$

M = mass
L = length

W = width
D = density
Percent Calculation

$$\frac{EFA(mm^2) * 100ml * MA(g) * RW(g)}{VF(ml) * IW(g) * AA(mm^2) * RJ(g)}$$

The calculated value is then multiplied by 100 to convert it to percent.

EFA – Effective filter area
MA – Mass of asbestos
RW – Weight of residue
VF – Volume filtered
IW – Initial weight of the sample
AA – Area analyzed
RJ – Weight of residue placed into the jar

Limit of Detection and Quantification

We used the mass of a 0.5 x 0.04-micron tremolite or chrysotile fiber, depending on what was found in each sample, as the basis for our calculations. Limit of detection was defined as 1 fiber and limit of quantification was defined as 4 fibers.

Some aliquots of sample D58 contained very small amounts of asbestos that were either at or below our 4-fiber limit of quantification. For these samples we defined our limit of quantification as follows:

308006-6A: mass of the two observed chrysotile structures plus the mass of two chrysotile fibers measuring 0.5 x 0.04 microns
308006-6B: mass of 4 chrysotile fibers measuring 0.5 x 0.04-micron

Discussion and Interpretation of Analytical Findings:

308006-6, 6A, 6B Client Sample D-58

PLM

All three aliquots of sample D-58 were analyzed by (b) (6) on September 13, 2019. No asbestos or non-asbestos amphibole variants were detected the samples. The results were calculated using the equations detailed in the calculations section.

308006-6	NAD
308006-6A	NAD
308006-6B	NAD

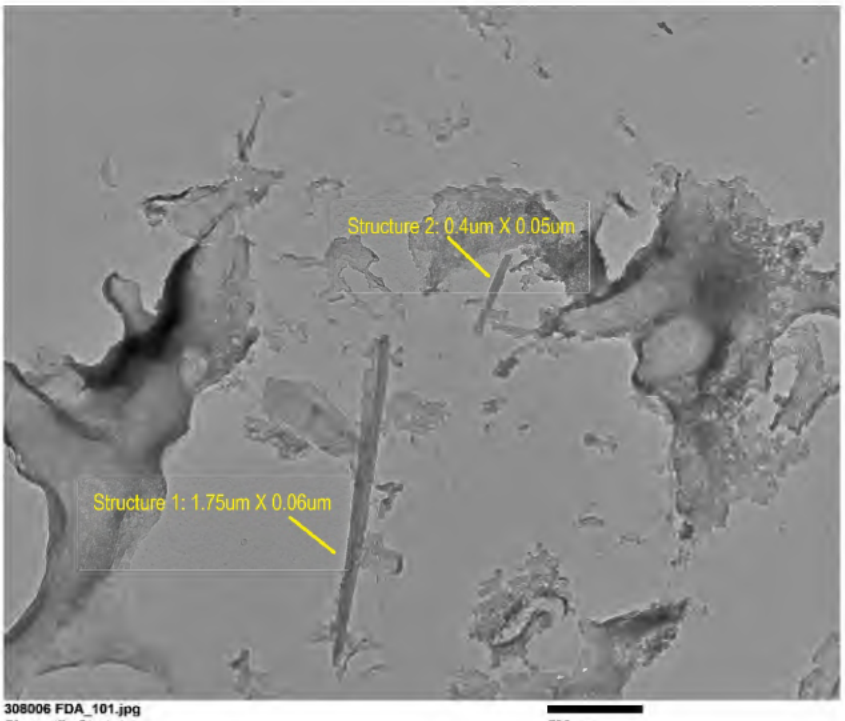
TEM

Sample 6 was analyzed by (b) (6) on September 3, 2019. Samples 6A and 6B were analyzed by (b) (6) (b) (6) on September 7, 2019. The primary particle observed was talc along with a few talc fibers, talc ribbons and mica particles. Two Chrysotile structures were detected on the aliquot for 6A and four chrysotile structures were detected on the aliquot for 6B. The results were calculated using the equations detailed in the calculations section.

308006-6	NAD
308006-6A	<0.00002%
308006-6B	0.00002%

Below are pictures, diffraction patterns, and chemistry from some of the observed particles. The unidentified peaks in chemistry spectra are copper, zinc, and carbon. Those peaks are from the TEM specimen holder and specimen grid.

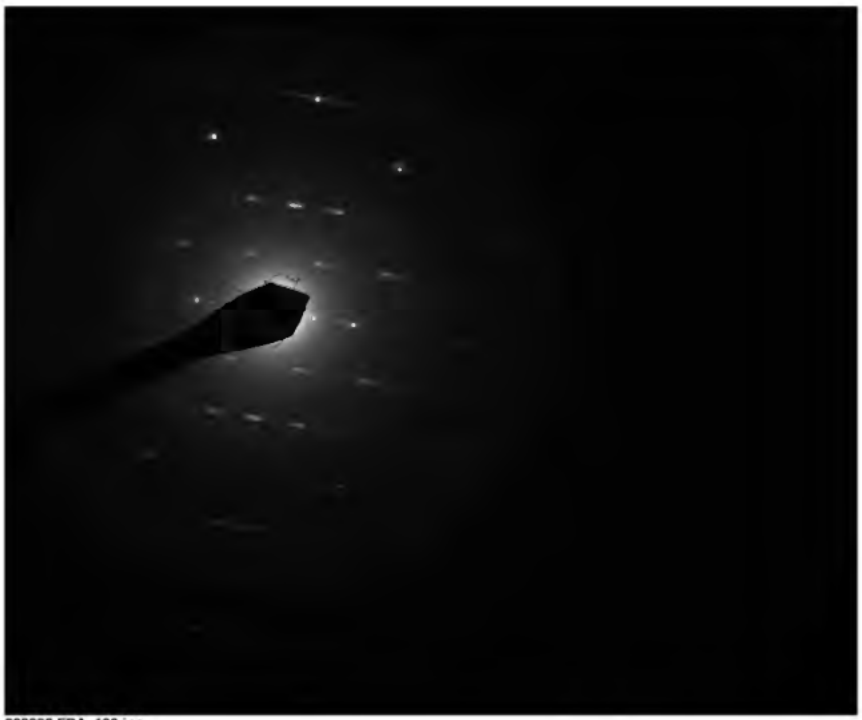
Sample 308006-6A, Chrysotile Structures



308006 FDA_101.jpg
Chrysotile Strutctures
308006-6a
Cal: 0.001774 µm/pix
14:06 9/7/2019
TEM Mode: Imaging
Microscopist: CD
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 std. frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

500 nm
HV=100kV
Direct Mag: 5800 x
AMA Analytical Services, Inc

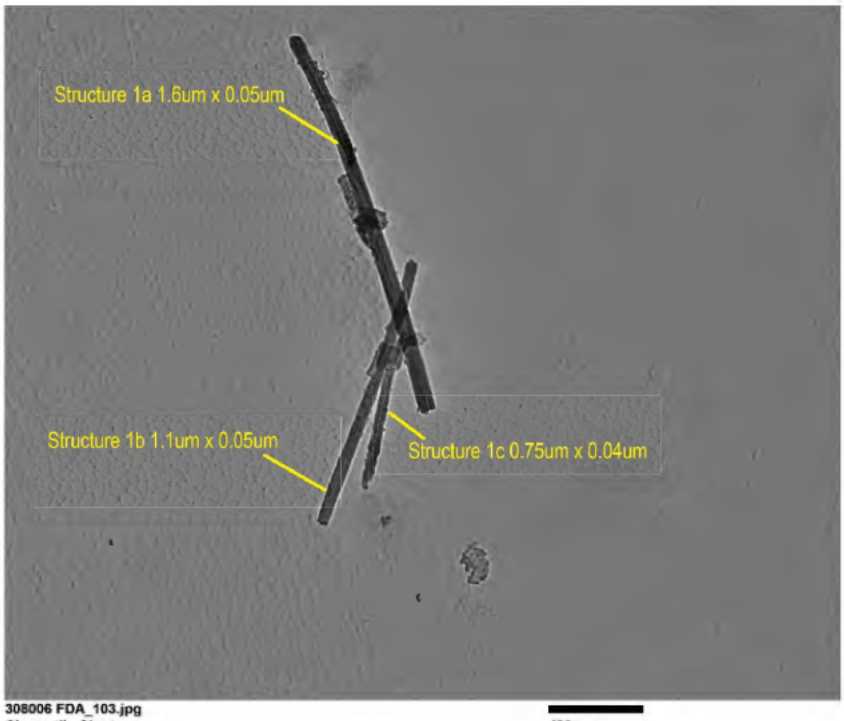
Diffraction Pattern from Chrysotile Structure 1 pictured above



308006 FDA_100.jpg
Chrysotile Dif
308006-6a
14:03 9/7/2019
TEM Mode: Diffraction
Microscopist: CD
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 std. frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

100 (1/Å)
HV=100kV
Cam Len: 0.2200 m
AMA Analytical Services, Inc

Sample 308006-6B, Chrysotile Structure 1



308006 FDA_103.jpg
Chrysotile Cluster
308006-6b
Cal: 0.001429 µm/pix
15:33 9/7/2019
TEM Mode: Imaging
Microscopist: CD
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 std. frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

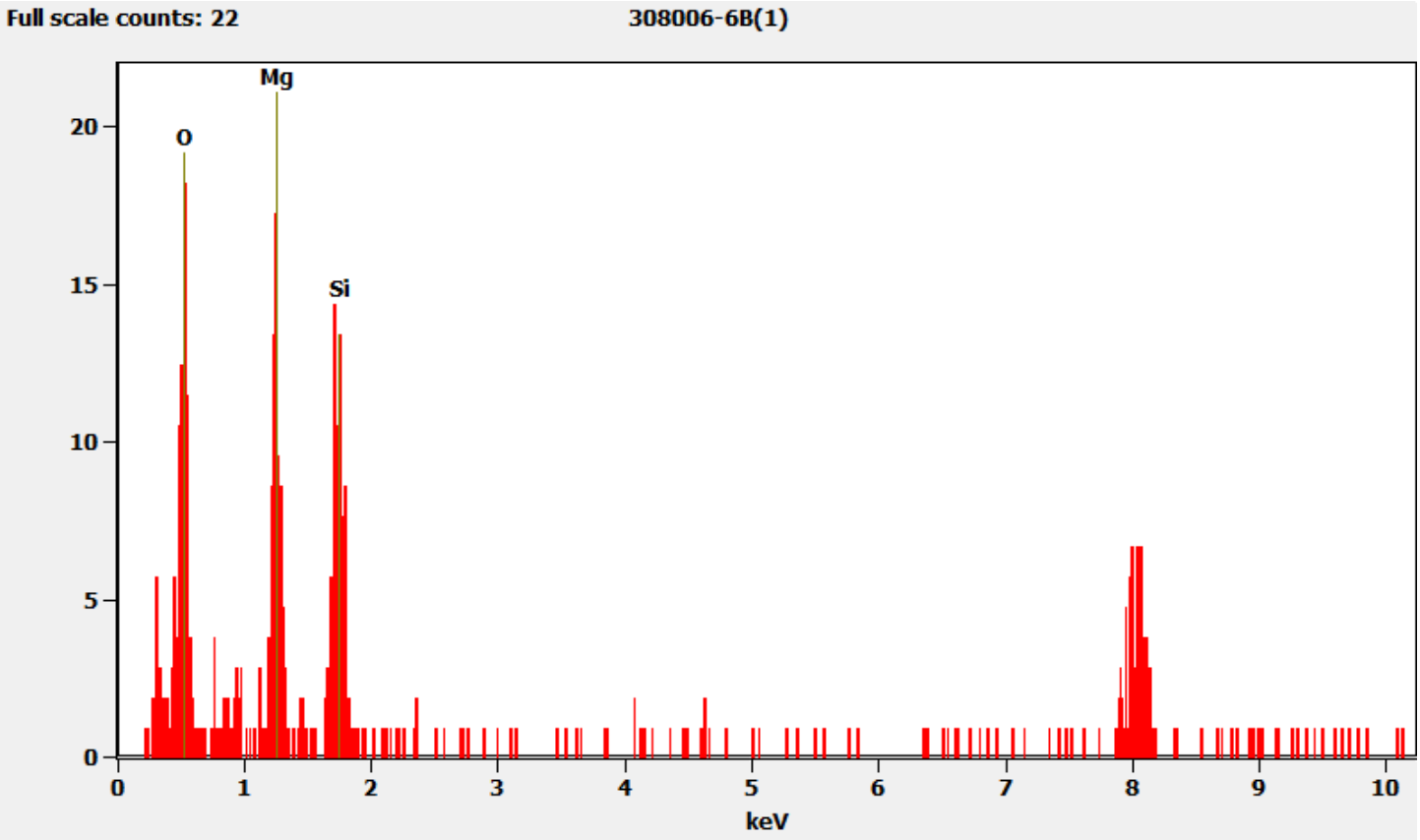
400 nm
HV=100kV
Direct Mag: 7200 x
AMA Analytical Services, Inc

Diffraction Pattern from Chrysotile Structure pictured above

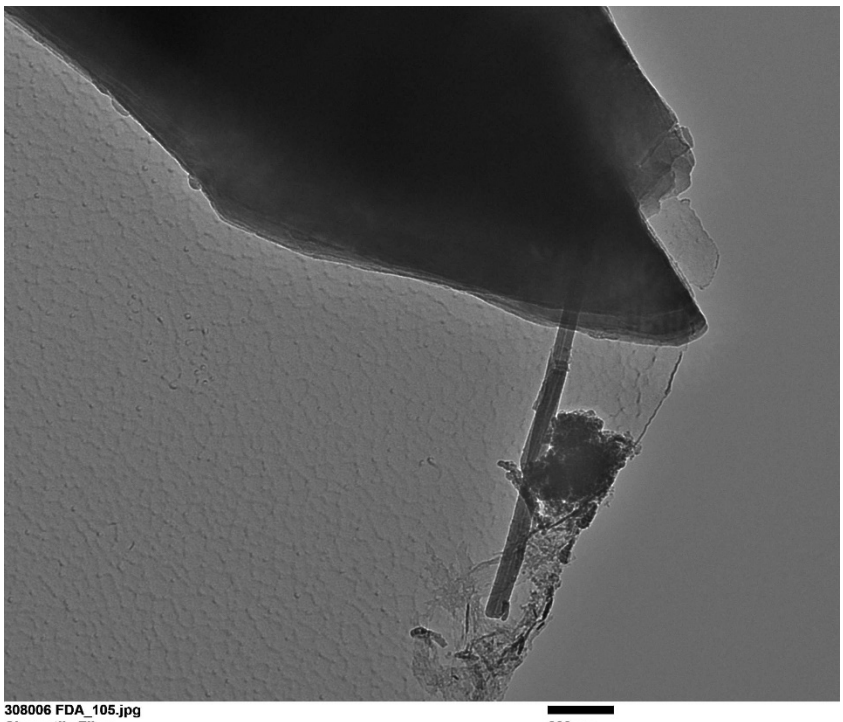
308006 FDA_102.jpg
Chrysotile Dif
308006-6b
15:32 9/7/2019
TEM Mode: Diffraction
Microscopist: CD
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 std. frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

100 (1/Å)
HV=100kV
Cam Len: 0.2200 m
AMA Analytical Services, Inc

Chemistry from Chrysotile Structure pictured above



308006-6B, Chrysotile Structure 2



308006 FDA_105.jpg
Chrysotile Fiber
308006-6b
Cal: 0.001029 µm/pix
16:05 9/7/2019
TEM Mode: Imaging
Microscopist: CD
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 std. frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

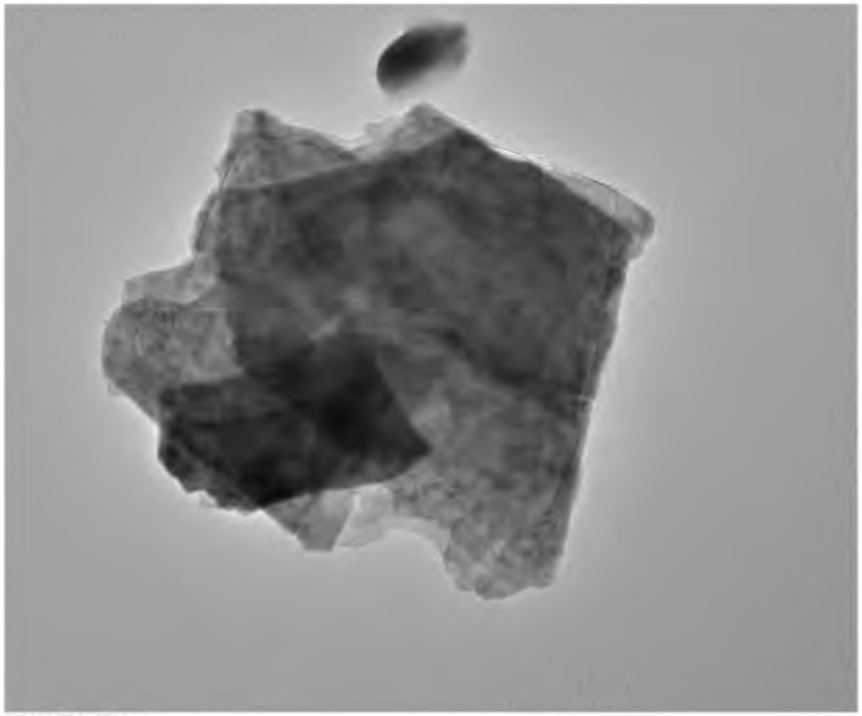
200 nm
HV=100kV
Direct Mag: 10000 x
AMA Analytical Services, Inc

Diffraction Pattern from Chrysotile Structure pictured above

308006 FDA_104.jpg
Chrysotile Dif
308006-6b
16:03 9/7/2019
TEM Mode: Diffraction
Microscopist: CD
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 std. frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

100 (1/Å)
HV=100kV
Cam Len: 0.2200 m
AMA Analytical Services, Inc

308006-6, Talc Particle

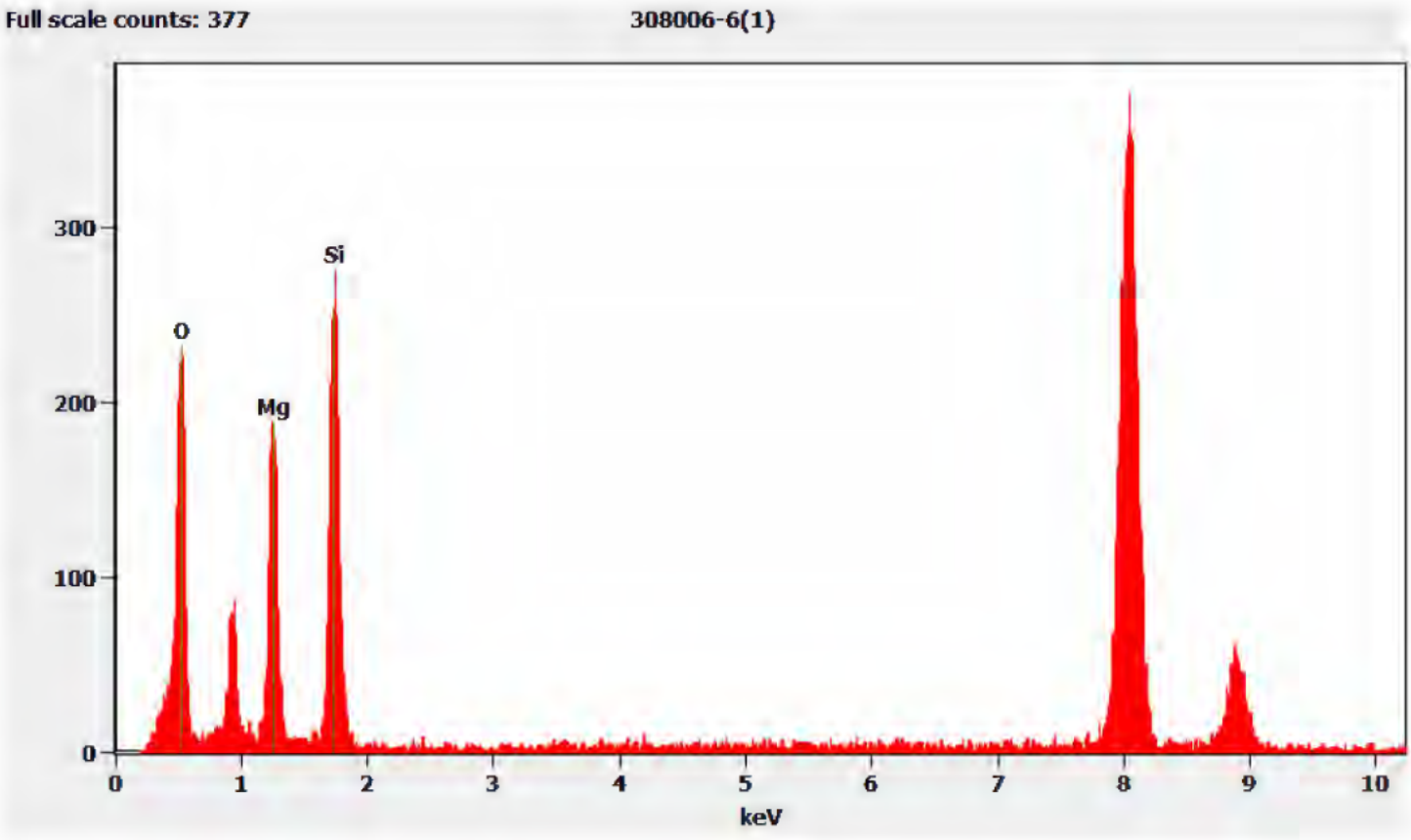


308006 FDA_052.jpg
Talc Particle
Cal: 0.001774 µm/pix
17:18 9/3/2019
TEM Mode: Imaging
Microscopist: MG
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 drift frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

500 nm
HV=100kV
Direct Mag: 5800 x
AMA Analytical Services, Inc

Hexagonal Diffraction Pattern from Talc Particle pictured above

Chemistry from Talc Particle pictured above



306008-6, Mica Particle

308006 FDA_054.jpg
Mica Particle
Cal: 0.001429 µm/pix
17:21 9/3/2019
TEM Mode: Imaging
Microscopist: MG
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 drift frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

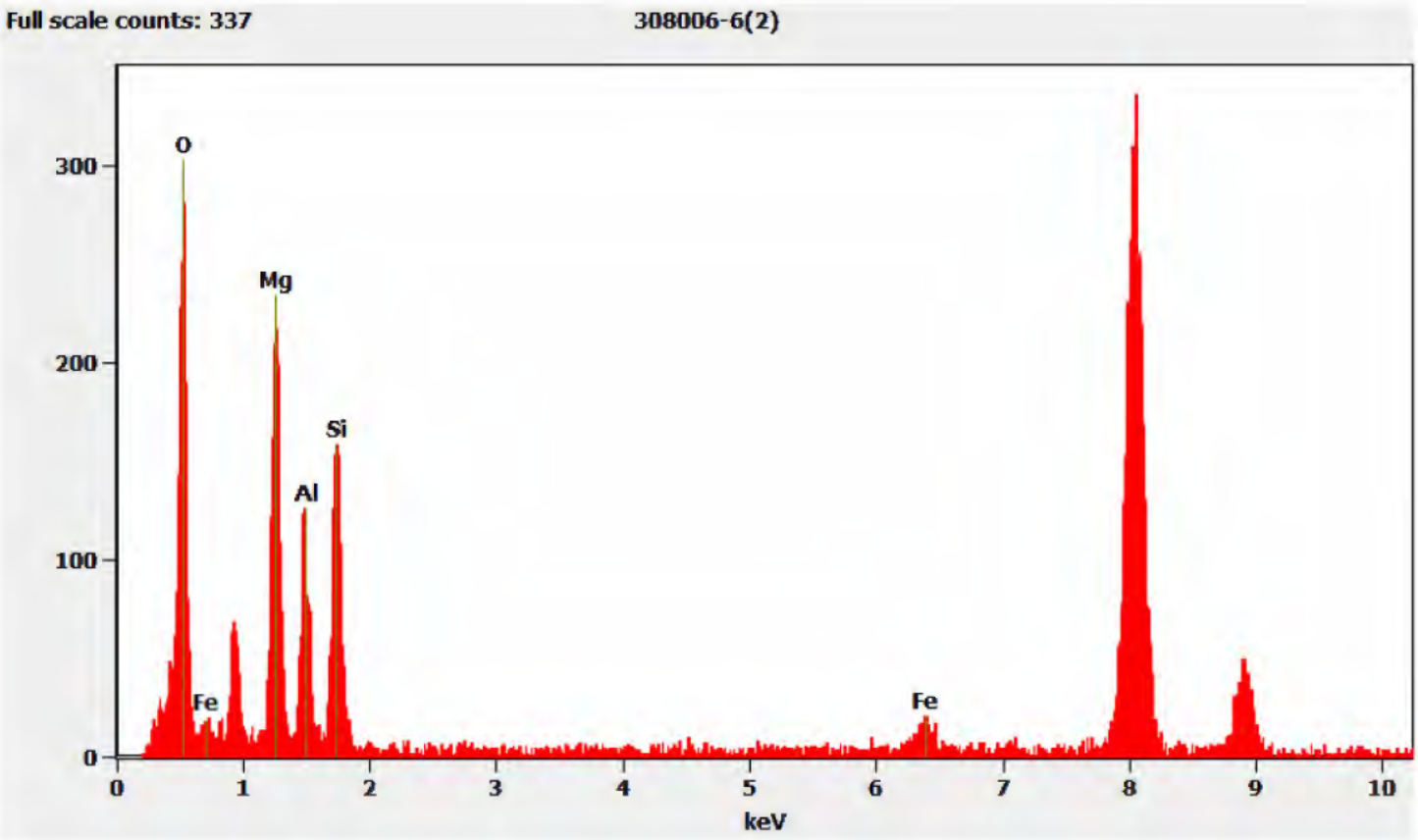
400 nm
HV=100kV
Direct Mag: 7200 x
AMA Analytical Services, Inc

Diffraction Pattern from Mica Particle pictured above

308006 FDA_056.jpg
Mica Particle
17:22 9/3/2019
TEM Mode: Diffraction
Microscopist: MG
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 drift frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

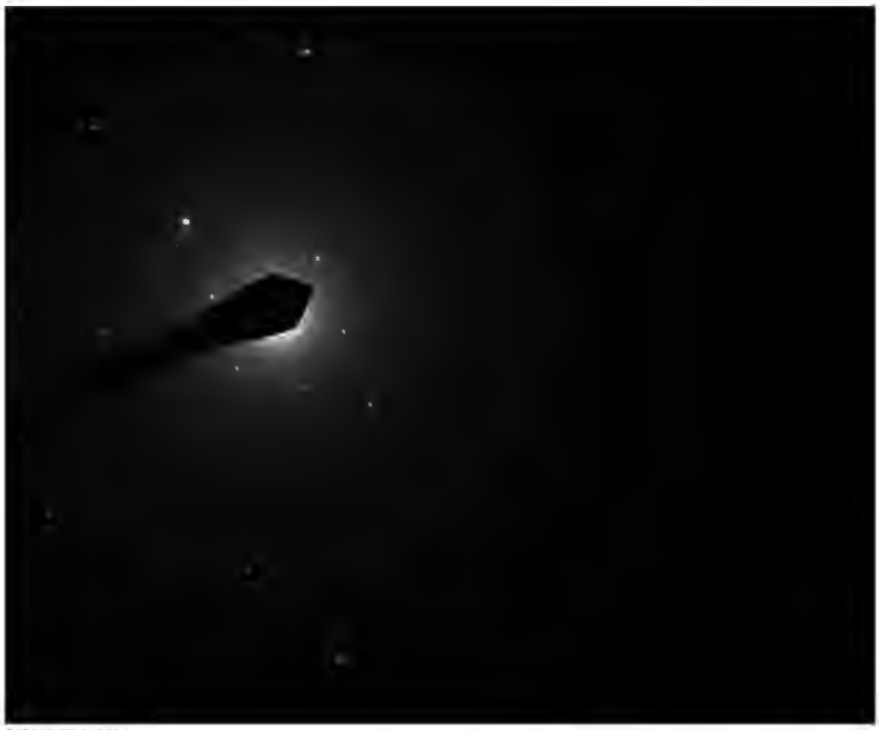
100 (1/Å)
HV=100kV
Cam Len: 0.2200 m
AMA Analytical Services, Inc

Chemistry from Mica Particle pictured above

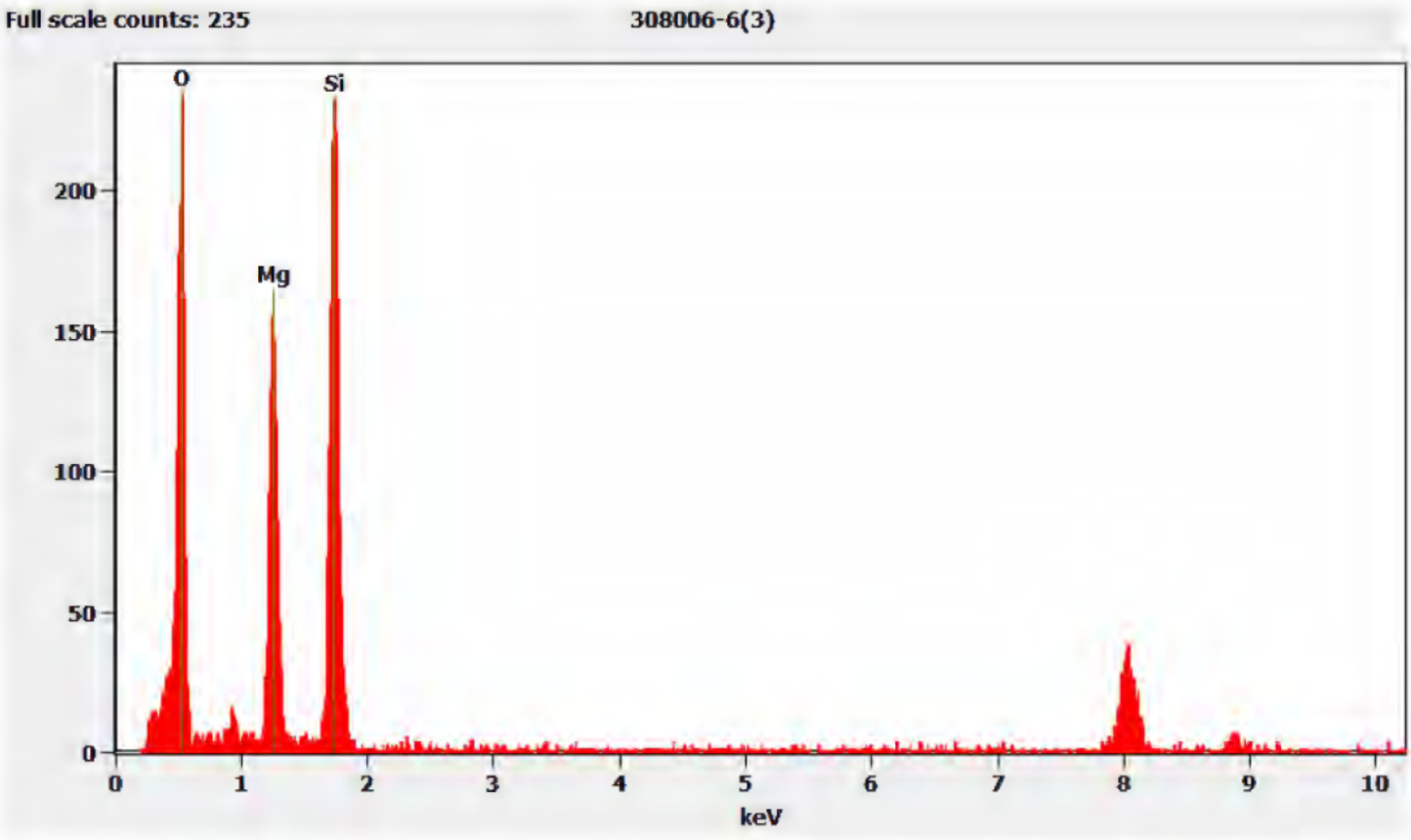


308006-6, Talc Fiber

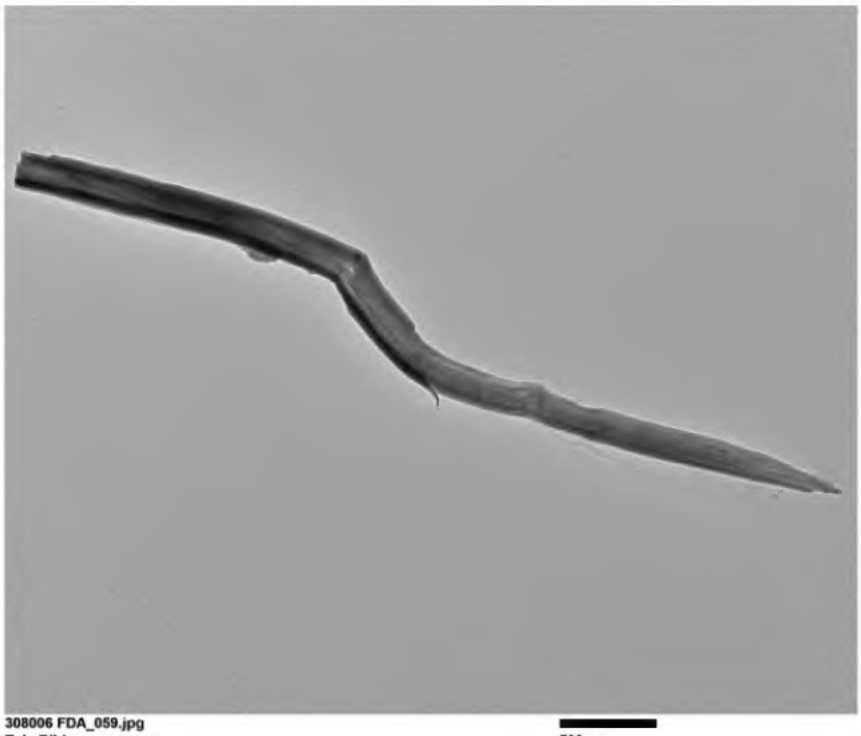
Diffraction Pattern from Talc Fiber pictured above



Chemistry from Talc Fiber pictured above



308006-6, Talc Ribbon



308006 FDA_059.jpg
Talc Ribbon
Cal: 0.001774 µm/pix
17:37 9/3/2019
TEM Mode: Imaging
Microscopist: MG
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 drift frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

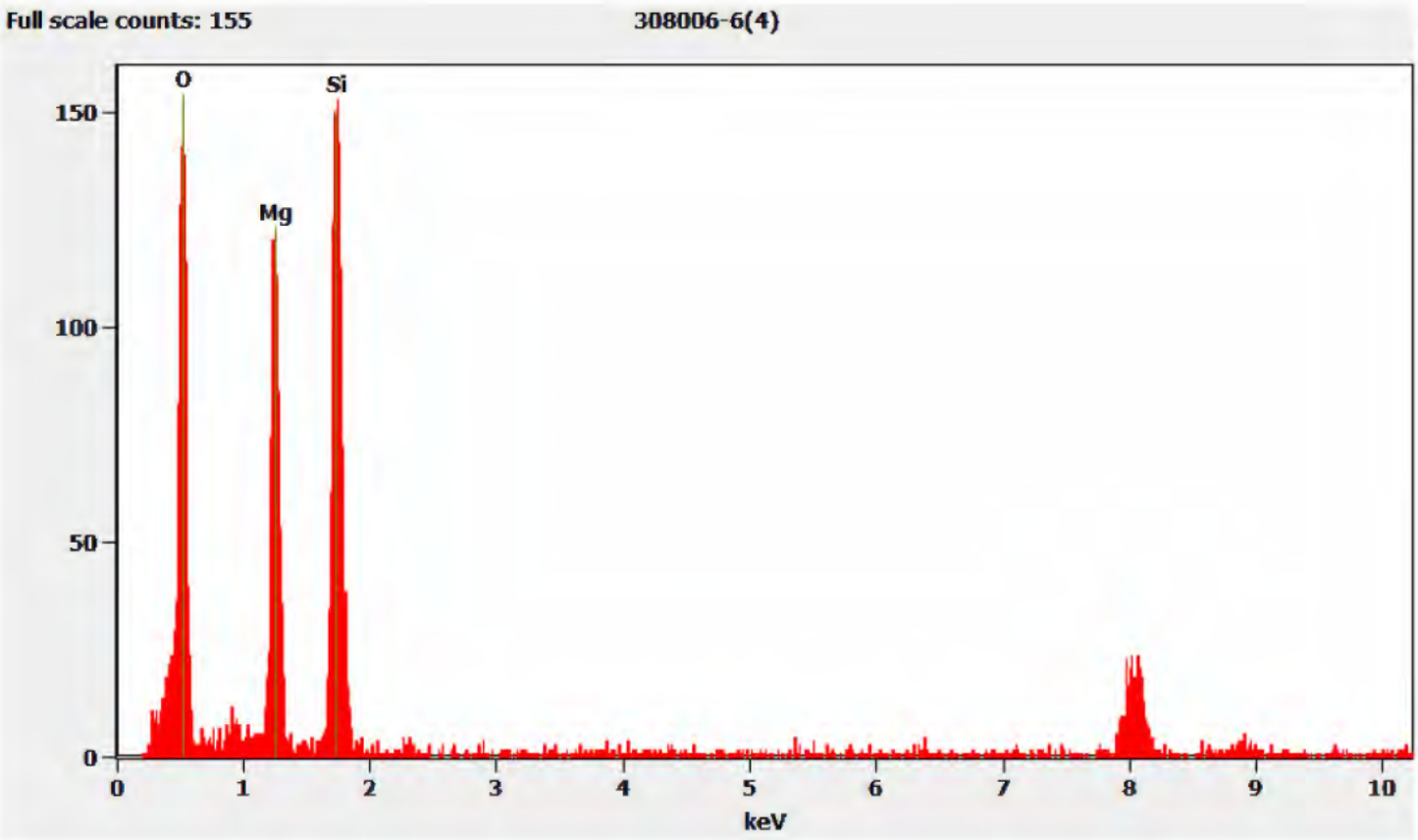
500 nm
HV=100kV
Direct Mag: 5800 x
AMA Analytical Services, Inc

Diffraction Pattern from Talc Ribbon pictured above

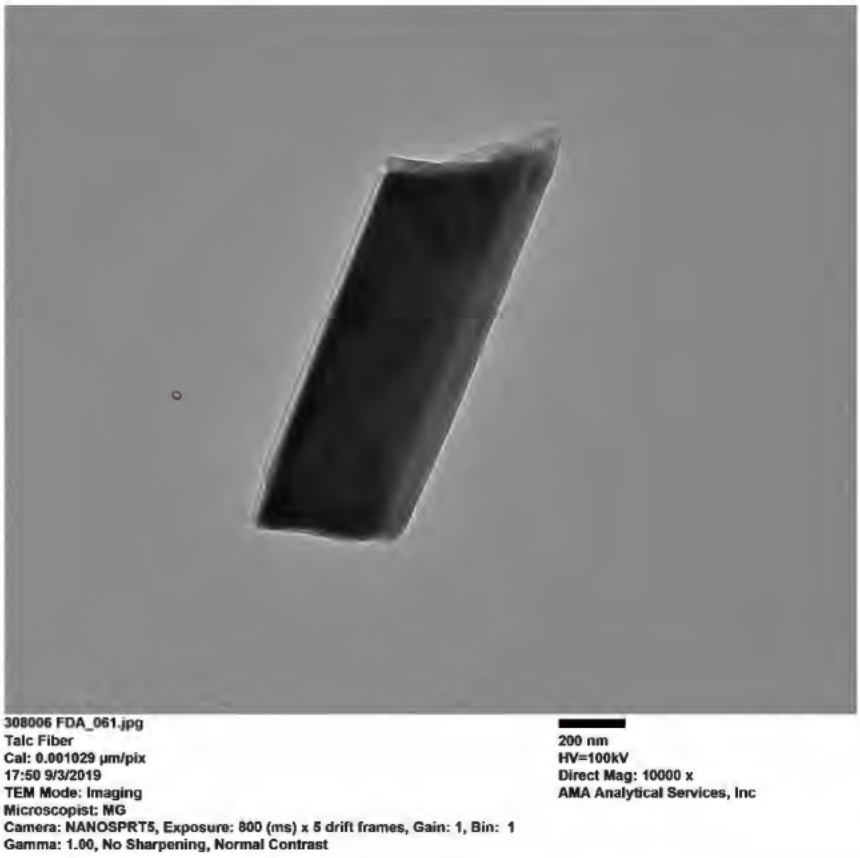
308006 FDA_060.jpg
Talc Ribbon
17:38 9/3/2019
TEM Mode: Diffraction
Microscopist: MG
Camera: NANOSPRT5, Exposure: 800 (ms) x 5 drift frames, Gain: 1, Bin: 1
Gamma: 1.00, No Sharpening, Normal Contrast

100 (1/Å)
HV=100kV
Cam Len: 0.2200 m
AMA Analytical Services, Inc

Chemistry from Talc Ribbon pictured above

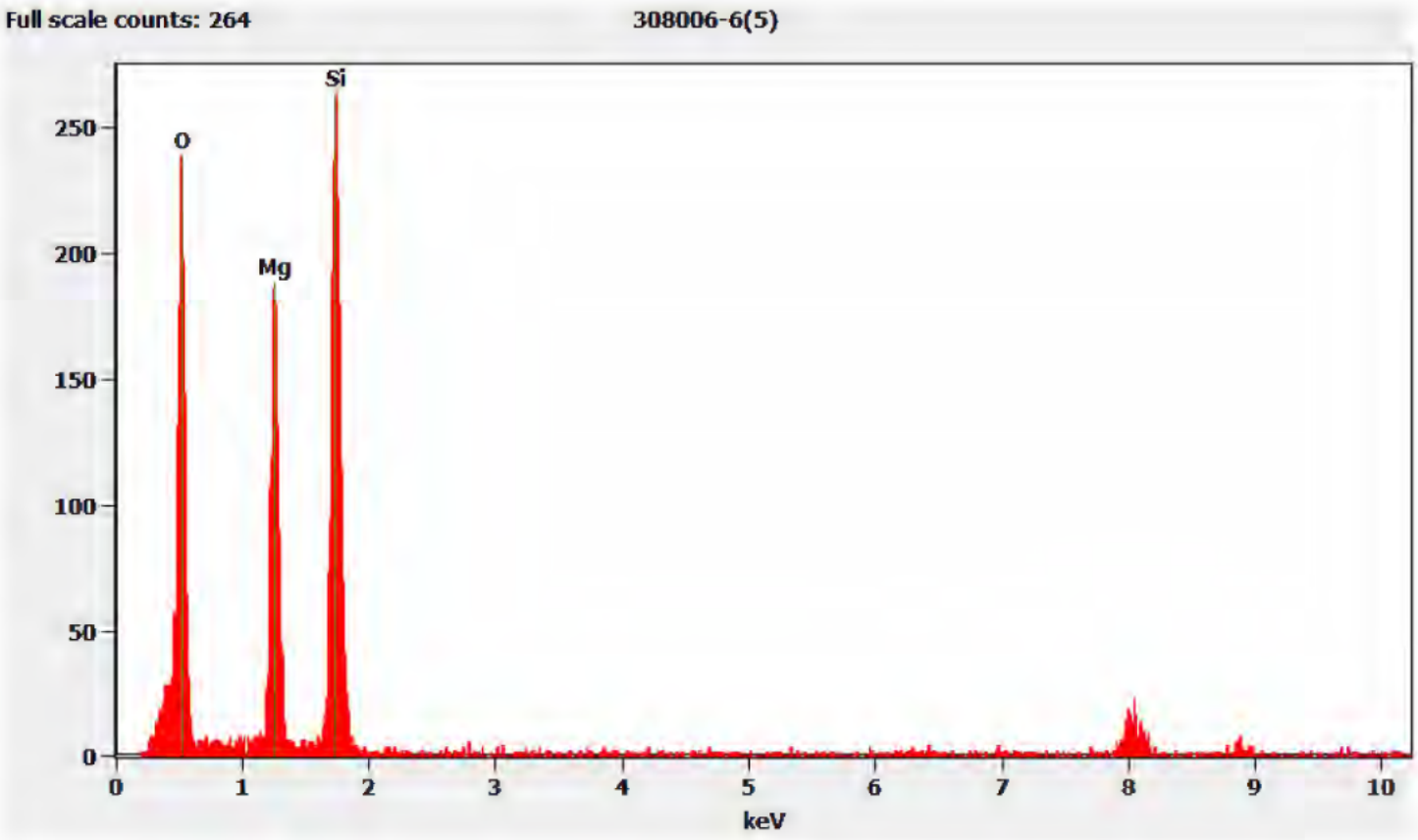


308006-6, Talc Fiber



Diffraction Pattern from Talc Fiber pictured above

Chemistry from Talc Fiber pictured above



QC Discussion:
During preparation, three blank control samples and one reference control sample were prepared. These samples were prepared alongside the customer samples. The blank samples were prepared using Sigma-Aldrich Talc Powder, <10 micron, and was analyzed by (b) (6) on September 18, 2019. No asbestos was detected on the blank samples. The reference sample was made from the same Sigma-Aldrich talc powder spiked with 10% Chrysotile. The reference sample was analyzed by (b) (6) on September 18, 2019 and found to be within acceptable limits. Additionally, filter blanks were prepared with each batch of carbon coated filters. Filter blank number EB-54155 was associated with the carbon coating for samples 308006-6, 6A, 6B/D-58. No asbestos was detected on the filter blank sample.

Our laboratory information management system (LIMS) randomly selected samples 308006-2/D-54 and 308006-15/D-67 for additional replicate QC analysis. Separate preparations were made for PLM and TEM analysis. The replicate QC analysis was performed by (b) (6) on September 13, 2019, 2019 for PLM analysis and by (b) (6) on September 18, 2019 for TEM analysis. The QC results matched the original analysis.

Attachments:
The following items are attached to this case narrative for your reference:

1) Sample Log-In Sheet
2) Daily PLM Scope Calibration Log
3) Refractive Index Oil Calibration Log
4) Daily TEM Scope Calibration Log
5) QC Results Summary
6) Replicate & Duplicate QC Chart for (b) (6) for samples analyzed between 1/1/2019 and 9/18/2019
7) Replicate & Duplicate QC Chart for (b) (6) for samples analyzed between 1/1/2019 and 9/18/2019
8) Replicate & Duplicate QC Chart for (b) (6) for samples analyzed between 1/1/2018 and 9/18/2019
9) Raw Data Sheets
    a. Gravimetric Data
    b. Filtration Worksheets
    c. PLM Analysis
    d. TEM Analysis
    e. QC Samples

I certify that all information contained in this report pertaining to laboratory events, procedures, and protocols is true and accurately describes the handling of this project by AMA Analytical Services, Inc. and its personnel.

10/11/2019

Andreas Saldivar — Date
Laboratory Director